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ABSTRACT

The papers presented at this conference challenged participants to become an integral part of the planning necessary to keep libraries on the cutting edge of technological advances. Academic libraries are admonished to reposition themselves to deliver both new and traditional services, or face the prospect of being preempted by other agencies. The selected paper of the conference, "Nebraska Online," explains the electronic information service developed by the Library Commission to support economic development; other papers address a wide variety of issues pertaining to technology. The 10 papers included in the collection are: (1) "How To Plan a LAN?" (Mel Bohn and Robert S. Runyon); (2) "Multimedia: Trends and Implications for Libraries" (Burns Smith Davis); (3) "Teaching Technological Skills in the Library Setting: A Trainer's Perspective of the Process, the Challenge, and the Strategies" (Paul S. Hoffman); (4) "CELS: Electronic Library Services at the Creighton University Health Sciences Library" (Richard Jizba); (5) "Compensating for the Limitations of Subject Indexing in Bibliographic Databases" (Richard Jizba); (6) "Common Command Language" (Donna J. Jurena); (7) "Evaluation of Online Catalogs Accessible Through Internet" (Frank H. Sun); (8) "A Fulbright? For Librarians?!?" (Thomas A. Tollman); (9) "Nebraska Online: The Nebraska Development Information Partnership" (Vern Buis, Mary Jo Ryan, and Rob Wagner); and (10) "The Virtual Library: Illusion or Reality?" (Kate Wakefield). Most of the papers contain bibliographies, some of which are extensive. (KRN)

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"TECHNOLOGY: TODAY AND TOMORROW"

1992 SPRING MEETING

PROCEEDINGS

NEBRASKA LIBRARY ASSOCIATION

COLLEGE AND UNIVERSITY SECTION
AND
SPECIAL AND INSTITUTIONAL SECTION

MIDLAND LUTHERAN COLLEGE

FREMONT, NEBRASKA

MAY 22, 1992

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MAY 22, 1992

Debra Pearson
Editor

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NEBRASKA LIBRARY ASSOCIATION

COLLEGE AND UNIVERSITY SECTION

INTRODUCTION

This year's theme, "Technology: Today and Tomorrow", suggests the role libraries must take to provide the kind of services our patrons expect now and will continue to count on in the decades to come. The papers presented at the Spring Conference of the Nebraska Library Association's College and University Section/Special and Institutional Section challenged the participants to become an integral part of the planning necessary to keep libraries on the cutting edge of technological advances. Our key note speaker, Dr. Kenneth Marks, Library Director at East Carolina University, spoke on "Libraries and Technology Today and Tomorrow". Dr. Marks feels that in order for academic libraries to survive, they will have to reposition themselves to deliver both new and traditional services or face the prospect of being preempted by other agencies. Whether or not academic librarians are successful, he says, will depend upon their capacity to adopt sweeping fundamental changes.

The selected paper of the conference, "Nebraska Online", was presented by Rod Wagner, Director of the Nebraska Library Commission. Rod explained the Nebraska Online system, which is an electronic information service created to support needs for economic development developed by the Library Commission.

The papers presented in the afternoon sessions addressed a wide variety of issues including virtual reality, training, and planning of a LAN. Electronic access as it pertains to mediated library services, evaluation of online catalogs through Internet and subject indexing were also topics of papers. Common command language, multimedia trends and information on Fulbright scholarships librarians rounded out an extremely informative day.

The Executive Board of the College and University Section and the Special and Institutional Section would like to thank Midland Lutheran College for hosting this year's conference and to thank all those who helped make it a success.

Debra Pearson
June, 1992

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PAPER CONTRIBUTORS

Mel Bohn
Humanities Librarian
University of Nebraska at Omaha

Buis, Vern
Director of Computer Applications
Nebraska Library Commission

Davis, Burns Smith
Information Resources Librarian
Nebraska Library Commission

Hoffman, Paul S.
NEBASE/OCLC Member Services Coordinator
Nebraska Library Commission

Jizba, Richard
Reference Librarian
Health Sciences Library
Creighton University

Jurena, Donna
Assistant Director, Public Services Librarian
Perkins Library
Doane College

Runyon, Robert
Library Director
University of Nebraska at Omaha

Ryan, Mary Jo
Public Information Coordinator
Nebraska Library Commission

Sun, Frank H.
Serials Cataloger
University of Nebraska-Lincoln

Tollman, Thomas A.
Education Librarian
University of Nebraska at Omaha

Wagner, Rod
Director, Nebraska Library Commission

Wakefield, Kate
Administrative Assistant for Library and Information Services and NEBASE

HOW TO PLAN A LAN?

Mel Bohn
Robert S. Runyon

University of Nebraska at Omaha

A Presentation to the Nebraska Library Association
Midland Lutheran College
Fremont, NE

June 18, 1992

Introduction

Mel and I have divided up our presentation into parts which correspond to the two aspects of the UNO Library's CD-ROM LAN PLAN which each of us knows the best. I will begin with an overview of our initial plan, concentrating on the organization of our project team, and then Mel will discuss how the plan was carried out in the Reference Department Our presentation is structured in terms of imputed questions of LAN planners.

Part I

Several basic questions arise when you begin to think about LAN planning. Among these are the following: 1) Where do you begin? 2) Who will do the work? 3) What's on the market? 4) What do we need? 5) What can we afford? 6) What about the future?

1. Where do you begin?

Like many libraries, in January 1991 we had a small investment in a couple of stand-alone CD-ROM workstations, and we wished to upgrade our capabilities into a library local area network. We wanted to provide simultaneous access to multiple databases and disk sets from at least five library workstations. Recent experience in installing an integrated library system (Innovative Interfaces) provided us with some understanding of the issues, although we were (and still are) a long way from fully integrating that system and all its capabilities into the work procedures of each department.

Much is now being written on CD-ROM products in libraries. These sources are never an adequate substitute for experience, but useful practical suggestions may often be found in this literature.[1]

2. Who will do the work?

One of the great challenges in utilizing any complex technology is developing and finding the people with all the skills needed to do the work.

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[1] Cochenour, John and Patricia Weaver-Meyers. "CD-ROM: Practical Considerations for Libraries," Journal of Library Administration, Vol 9 (3) 1988, p. 57-67. Offers a useful checklist for selecting CD-ROM LAN components.

Carey, Joan and Virginia Massey-Burzio. "Installing a Local Area Compact Disk Network." C&RL News, December, 1989, p.988-991.

Flanders, Bruce L. "Spinning the Hits: CD-ROM Networks in Libraries." American Libraries, December, 1990, p. 1032-1033.

Bunge, Charles A. "CD-ROM Stress." Library Journal, April 15, 1991, p. 63-4.

Not infrequently there is insufficient funding to hire people who already have the requisite skills. For instance, no funding has ever been provided at UNO for additional staff to support the implementation of new library computer systems. Consequently, we have had to adopt a mode of learning as we go. I find that interesting because when you look at studies of other OPAC installations, especially NOTIS, you learn that personnel expenditures for systems increased by as much as 300%.

When we were negotiating for the purchase of an Integrated Library System, we had no systems position and few staff members with any computer expertise. We coped with the new technical demands that threatened to overwhelm us by dividing up essential tasks into chewable chunks that several people could do by learning on the job. From an administrative perspective, our primary approach was to break systems projects up into smaller and simpler pieces that could be handled with available staff. In the course of this process, we learned an operating style which says in effect, "It must be done with existing personnel lines or not at all."

When we looked at the CD-ROM LAN project, there seemed to be two chewable chunks that could be practically separated. The selection of bibliographic databases and search software clearly belonged in the domain of the Reference Department. Since the reference librarians would be the ones to use the system and to teach its use to students and faculty, they had to be involved in this particular selection process. The systems issues were a different but not wholly unrelated matter.

We assigned the systems tasks and responsibility for overall CD-ROM LAN project management to the Circulation Department Chairperson. In our organization, that individual was already charged with responsibility for OPAC system hardware planning and operational control. We had earlier done extensive reorganization within his department in order to create a systems specialist position and that individual reported to him.

This organization, while leading to some overlapping of responsibilities, turned out well in terms of results. Creative and resourceful people, one finds, are often able to transcend staff and structural limitations. It would have been much easier and neater if we had a designated position for library-wide systems coordination, but we couldn't afford it. Such an individual would have been the logical one to manage the CD-ROM LAN project.

As it played out, the Circulation Department Chair managed the selection of CD-ROM LAN components, and also the installation of equipment. Just as with the OPAC a year earlier, we were cutting our teeth on a complex task that had not been done before in our library. We were able to proceed with greater confidence this time, however, because we had significant OPAC learning experience under our belts. We had much deeper staff expertise in related areas of systems planning.

As a general principle, I find that effective systems work requires people to learn and to practice what I call "boundary spanning" skills. That is, the ability to perceive needs and accept responsibility for conditions that may exist or suddenly arise in someone else's bailiwick or satrapy. It is a rare capability and much to be prized. It transcends narrow, department-centered attitudes and reaches out into ever-widening circles of interest, energy, and commitment.

There are many components of a CD-ROM LAN that have to be analyzed, evaluated and integrated in order to assemble a workable and affordable system. In our setting, no person or department had sufficient depth to do the complete job. Encouraging staff members to relinquish a departmental gestalt, and to focus creative energies upon library-wide conditions is a continuing administrative challenge. It all comes down to teamwork.

3. What's on the market?

The multiplicity of hardware and systems software options required some members of our project team to take a close look at the CD-ROM LAN marketplace. We needed to know what was out there and at what price. The market place for CD-ROM and LAN equipment is probably the most dynamic that we know of in the library field. It has gone from a very slow start in the mid 1980's to today's frenzied clamor of announcements for new databases and network configurations.

4. What do we need?

Our CD-ROM procurement process began with choices made in the Reference Department regarding the comparative merits of existing databases and projected future acquisitions. At the same time, it was necessary to evaluate how effectively each vendor's products could be supported. The team had to consider hardware and software compatibility as well as in-house technical expertise and training requirements.

We chose to delineate the Reference Department involvement still further in order to achieve enhanced levels of individual contribution and systems support. We reasoned that the database selection task was one that could be organized separately and worked on by a team that included staff from other departments including collection development and technical services. A cluster of cost issues began to be evaluated at this point. CD-ROM Databases require long-term financial commitments, much like serials, and therefore budget decisions must be made that extend several years into the future.

We also found it useful to separate the systems equipment planning and selection functions from the responsibility for daily operational maintenance and support of the network. Hardware and software selection and installation became the purview of the project leader and the systems specialist, while a Reference Department member (my co-presenter) was given training in Novelle LAN system operation, so that he could take on critical network support and maintenance duties.

5. What can we afford?

Funding issues always focus the attention and get the juices flowing. At least we have found that to be the case in our situation. The little window of opportunity for possible funding to purchase a CD-ROM LAN for our library was a semi-annual Academic Affairs equipment funding cycle in January. We had a month or so to prepare the proposal for approval. If we received the funding, we would not be notified until late March. Then we would have only April, May and June to complete the evaluation, selection, bid, and purchase processes.

We pondered a while before writing the formal proposal because everyone already felt overworked. Some staff members were stressed out following implementation of the new OPAC. Did we have the temerity to launch yet another complex systems project, with unforeseen technical problems, and leading to uncertain new demands upon staff assignments and public services? There were some who advocated that we defer the LAN PLAN and submit a traditional tables and chairs funding proposal to Academic Affairs. I reconsidered and nearly acceded to that view several times during the next few months. At least we knew how to select, bid, purchase and install *that* kind of equipment! CD-ROM towers, servers, and LAN software were a different matter. Without special new money, we could not consider a CD-ROM LAN purchase. If we did get the new money, we would be hard pressed to acquire the right equipment and get it installed and operational by the Fall Semester. As you must expect, we did submit the proposal, we were funded, and the team did get the CD-ROM LAN installed by September. It was a busy time for those who had to do the work.

We initiated inquiries through which we might trade off the experience of others, beginning with our colleagues at UN-L. They had just begun equipment demonstration and testing sessions for CD-ROM gear from two of the largest vendors of networked equipment. We profited greatly from their experience and reports of these vendors' products. Then we began to conduct our own parallel inquiries and studies. Within a matter of weeks, the project team made great headway and was able to complete a series of systems tasks.

6. What about the future?

After we succeeded in bringing eight or ten CD-ROM databases up and making them accessible from five new workstations on the LAN, the students, of course, became quickly addicted. They gobbled up the available capacity, and it became a regular thing to see all five workstations occupied and other patrons waiting to get their turn. The faculty loved it too, and some were even occasionally seen at the workstations doing their own searching. They had to come all the way to the library to do that!

The more demanding individuals, of course, expected more than they got. They really couldn't understand why the library hadn't made the new databases accessible on their office and home computers as well as on the library workstations. Since that had been done with the OPAC, they naturally questioned why it was not feasible to do the same with the CD-ROM article databases as well. We have yet to develop the means of explaining the intricacies of CD-ROM contracts licensing to the growing ranks of database users. A challenging new phrase became current in one college, "Any new library databases must be available on the desktop in order to be used by our faculty."

Postscript: After having struggled and succeeded to some degree in providing faculty with new levels of bibliographic access both within and beyond the library, our situation sometimes feels like grabbing a tiger by the tail, or feeding a dragon which later grows up and then decides to take a bite out of you. A rapid escalation of expectations occurs when libraries provide electronic information to end-users. The provider should be aware that the appetites he conditions may soon outdistance his ability to provide the required nourishment!

The next wave of user demands and systems innovations clearly calls for making more databases (based on either CD-ROM or tape-loaded central systems) available on the user's desktop. As one software developer reported recently, our company's "...strategy sees the desktop machine as the way the knowledge worker actually accesses the system - but there are many other pieces that are necessary as well." [2]

Part II

Bob has talked you about the administrative and managerial aspects of planning. He has given you an overview of who was involved in the decision making process and a little bit about the funding process. These are, of course, vital elements in planning when you are expending large sums of money for user services.

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[2] InfoWorld, May 4, 1992, p.54

7. How Do We Focus Our Needs?

What I want to do is with the time I have been allocated is to add a new dimension to the presentation by discussing some of the "nuts and bolts" aspects more closely related to the day-to-day CD-ROM LAN operations, particularly addressing those issues relating to user education.

There are several areas I want to discuss to help you get the optimal use from your Local Area Network. These include such topics as database selection, hardware selection, and software options. I'll address each of these issues in turn.

The first thing is to decide which databases you will need in your particular setting. These could either be standard indexes also available in print format, abstracting services such as ERIC, full text databases (for example the entire editorial content of the Omaha World Herald), or even multi-media databases such as the National Geographic's "Mammals" CD-ROM which offers full motion video. You need to determine if you going to be serving a very specialized clientele with rather esoteric databases, or whether you are going to be serving a more general population with databases such as those aimed at the lower division/undergraduate student. Before you can do any substantive planning, you should have a well developed service mission or philosophy down on paper.

The nature of your client service philosophy is a key consideration, since the vendors whose products you will have to use will be determined by which databases and services you want. At the University of Nebraska at Omaha, we started out with the ERIC database. Early on, we evaluated the three vendors offering ERIC and decided we liked the user interface offered by Silver Platter the best. Our staff had become accustomed to their search software. When we added PsychLit, we went with Silver Platter for the sake of consistency. It is axiomatic that whatever search software you use first, that is the one you will generally prefer. Later we added a database from University Microfilms (ABI/Inform) and one from WilsonDisc (the MLA Bibliography, which at the time was only available from H. W. Wilson). Each of these new databases has its own search platform, each of which is substantially different from Silver Platter in terms of the functions of the "F" keys and in the basic search strategies. The point I want to make is simply that the first thing you should do is to find out what clientele you are serving and which vendors offer databases that will meet the needs of that clientele. I would stress that it is important to think this through pretty carefully, because I strongly recommend that you come up with as few different vendors on your LAN as possible. The reasons are obvious. You will have fewer companies to deal with if ... maybe I should say when ... you have problems (such as with incompatibility), and likewise you will have fewer different search methodologies to teach to your students and faculty. So before you even think about anything else, start looking at which vendor has the most databases that will serve the needs of your clientele and go with that vendor for as many databases as possible. Depending on your individual situation, that could be Wilson, UMI, or Silver Platter, or someone else, such as Information Access.

8. Now That We Have Our LAN, What Do We Do?

Each of these vendors offers a search platform for their individual databases, but you will still need to develop a "home grown" "front end" for your LAN that allows your students and faculty to search databases from the various vendors. You will need to create or buy menu software. At UNO we use a product called Power Menu. Another alternative would be a menu program called Direct Access. These products do a couple of things that are going to be important to you. First, they provide for system security, i.e., they keep overzealous students from poking around on your network server, and they provide an easy way for the students to get to the various databases. It is vitally important to provide for system security before you put your workstations out where the students can get to them. Some college students pride themselves on being "hackers" and so you need to keep them from getting to the DOS prompt and possibly doing damage to your computers and/or your LAN software. On the other hand you will have many naive users who need a great deal of help in using the networked resources. A good front-end menu program helps to address both of those needs. Since the menu is the first contact the students will have with the LAN, give your choice of menu software careful thought.

Another thing to look for in menu programs is the ability to gather use statistics. The Power Menu program we use can generate use statistics by the database used and this is helpful in making decisions.

9. You Mean It's Already Obsolete?

Whatever you plan for, plan for it to be inadequate in a very short time. At UNO, we established our network just last August. We had purchased a tower with 12 CD-ROM drive bays. That is already not enough for all the products we want to provide to our students. We are now looking at doubling that capacity with a second tower. The point is -- whatever you think you will need ... plan on doubling it within a year or so. The cost of CD-ROM products (the software) is going to continue to come down as the number of copies sold goes up -- that's only logical in terms of our past experience. What that means to you is that your hardware needs to accommodate those products will continue to grow by leaps and bounds. And the hardware does get expensive. Our hardware investment to serve a half dozen new products will be in the neighborhood of $25,000 to $50,000. Since the options are changing so rapidly, I'm not going to talk about specific vendors or products. Just be certain that you have properly trained staff to operate the products you purchase. I would like to point out that "cheap" hardware probably will cost you more in the long run, because of the staff time involved in keeping it running properly.

10. Will We Ever Learn?

We had one learning experience that we would all like to forget. We acquired a product that was a tremendous memory hog. In fact, we were not able to offer it to our users at the LAN workstations because it required such an excessive amount of workstation memory. The only way we could get it to work was to disable the video RAM of a single workstation. That in turn led to problems with other products that used graphics as part of their user interface, such as Beilstein and UMI's ABI/Inform. Likewise, we discovered that Books in Print required so much RAM memory that we had to take similar steps to make it available. We could run products A and B on one workstation and C and D on another, but not all would run on a single workstation. You can minimize your anxieties by planning ahead and selecting products that interface with one another well. Make sure that the new products you acquire are compatible with the hardware and software you already have, otherwise you may find that they cost much more than their purchase price.

11. Why Do Vendors Make Our Lives So Difficult?

Vendors don't make any effort to make sure their products are compatible with their competitors' products. And why should they, if you consider that they have their own economic interests at heart. So... it's going to be up to you to figure out if there will be conflicts with memory allocation, etc. The vendors will only make sure that their own products will run together. And since it is very likely that you will want to put products from more than one vendor on your LAN, you need to get a lot of technical information up front, before you encumber your funds. Another problem with vendors and technical information that you should plan for is that they develop their software to work with a certain hardware/software configuration and if you vary from the standard, you may have to solve your own problems. An illustration of this is our experience with the way UMI and Wilson save temporary files and the time we spent solving these problems.

Perhaps the most costly aspect of the CD-ROM LAN is the training that your staff will have to give the students on how to use the products once they are in place. Make sure you select products and services that will not require an excessive amount of staff time in user instruction. We acquired one CD-ROM product whose search software was so poorly designed that even the librarians had trouble understanding it. Spend a lot of time evaluating products before you invest a lot of money, making sure that you have products that will not overburden your staff in the time that has to be spent with training users. That's another big asset of having as few vendors on your LAN as possible. You have fewer search mechanisms to teach. Also, look at the training aids that the vendors themselves are willing to supply ... these will make your job easier and less time consuming - and I don't have to tell you how important your time is!

MULTIMEDIA: TRENDS AND IMPLICATIONS FOR LIBRARIES

Burns Smith Davis

Nebraska Library Commission

Lincoln, Nebraska

ABSTRACT

Multimedia products are changing the way we learn, work, communicate, disseminate, store, sell, and control information. Most libraries are now serving clients who use or who are influenced by multimedia information products. Education and communication in areas served by small, geographically remote libraries will be some of the first to take advantage of multimedia technologies. Identifying and understanding the implications of the multimedia information shift will aid libraries to develop strategies to adjust budgets, resource management, and service approaches in order to maintain relevance to their clients' framework of reference.

The keys to success in the library business are knowing our merchandise and knowing our customers. My intent in examining some major development trends in multimedia technology is to encourage librarians to formulate pertinent questions, especially in relation to resource management, for assessing the role of multimedia technology in their local libraries. A brief view of what multimedia systems can do will provide insight into the reasons for their influence upon library patrons.

HOW MULTIMEDIA COINCIDES WITH THE WAY WE THINK

Vannevar Bush's Memex

In 1945, Vannevar Bush envisioned a device called a "memex" which would perform selection by mechanized association rather than by indexing because the human mind operates by association. According to Bush, this would be "a device in which an individual stores all of his books, records, and communications, and which is mechanized so that it may be consulted with exceeding speed and flexibility. It is an enlarged intimate supplement to his memory. . . It affords an immediate step, however, to associative indexing, the basic idea of which is a provision whereby any item may be caused at will to select immediately and automatically another. This is the essential feature of the memex. The process of tying two items together is the important thing." (Bush 1945, 107) The memex described by Bush exists today as multimedia systems.

Definition of Multimedia Systems

A multimedia computer system is one that can: create, store, import, retrieve, integrate, edit, and delete information utilizing two or more types of media materials--audio, image, full-motion video, or text--in digital form. (Bailey 1990, 29) It is a collection of techniques in a single electronic document.

Where Did It Come From? How Did We Get Here So Fast?

In 1987 development of hypercard stacks which use object-oriented programming opened the way for multimedia. Hypercard is a programming method of arranging information laterally in idea groups rather than hierarchically, as in an outline. HyperCard has been bundled with the system software of every Macintosh computer since 1987. Since 1989 software designers have taken advantage of the sound reproduction and graphic capabilities of Macintosh computers to create environments which use sound, text, graphics, and animation--"multimedia." By grouping pieces of multimedia information in a hyperstack, hypermedia software was created. The state of the art recognizes five types of systems: hypermedia, multimedia database systems, multimedia message systems, virtual reality systems, and intelligent agent systems. (Appendix 1) The multiple-sensory contact of the product so powerfully increased the effectiveness of the information delivery that multimedia has rocked the educational and commercial markets since becoming widely available in 1990.

The Way We Think

Studies of learning behaviors show that browsing, or "grazing" is a common way people acquire information. (Bates 1989, 409-10) Learning takes place when the information gathered is transferred to long-term memory through assimilation. Creative learning or creativity takes place when the learner tests and rearranges the learned information and extrapolates new sets of information. Information in multimedia formats has flexible, lateral concept groupings and high sensory relevance which means this information is more quickly assimilated by most people. (Yager 1991, 153) "Information grazing is part skill, part social contract, part file management, and part serendipity." (Rheingold 1992, 42) Multimedia format characteristics that align closely with the information gathering and learning processes are: 1) browsing nature; 2) independence from rote learning processes; 3) sensory connections to sight and sound; and 4) easy adaptation to extrapolation, self-testing, and reassembly of information. The claim for multimedia is that it facilitates the process of grasping understanding and synergizing creative products. (Yager 1991, 154) In addition to rapid assimilation, the user also experiences a high degree of believability and retention. Empathizing with the way users access information and appreciating the fun of information--the sensuality of information--can help us understand users' ready acceptance of multimedia.

CHARACTERISTICS OF THE MULTIMEDIA INFORMATION SHIFT

Design and Development Trends

Designs of multimedia systems exhibit eight major development trends which can be loosely grouped by aspects related to the operating characteristics of the systems, technology, and access management. (Figure 1) Most of these developments focus on features which will attract the consumer market.

The first development trend is the emphasis on interactive features in all applications which includes operating speed, animation sophistication, and

1. Emphasis on interactive features in all applications
2. Programming transparency
3. Blending of entertainment and education
4. Facilitation of on-demand publishing
5. Varied distribution formats
6. Concern with security issues and database integrity
7. Standardization
8. Copyright and intellectual property ownership

Figure 1. Design and Development Trends

efficiency in handling database complexity. These features are design concerns directly related to the cost effectiveness and competitive appeal of the products.

Programming transparency has resulted from the trend to design intuitive interfaces utilizing increasingly powerful intelligent agents, which can automatically refine searches for the user, to shield the user from the complexities of the system. Closer and more complex links with the user strive for an approximation to reality. Therefore, multimedia packages designed for the consumer market are accessible to the user without special training.

Blending entertainment and education is characteristic of multimedia design. These gaming structures are used to instruct or extrapolate situational variations. Because of these features, the products are fun to use.

Facilitation of on-demand publishing enables users to create their own multimedia documents from hypermedia or multimedia databases, create personal paths in existing databases, or create new works from existing parts.

A variety of distribution formats have been developed for multimedia packages. Multimedia formats are not necessarily limited to CD-ROM: distribution may be by wire, satellite, or networks. Computer messaging and conferencing systems have become increasingly important for distance education, economic development, and work collaboration.

Security issues and database integrity have assumed a significant place in programming and legal research. Multilevel secure database management systems (MLS/DBMS) are being developed in which users are allowed access only to the file version permitted for the access level open to that user's password. This is known as "polyinstantiation." (Lorenz 1991, 36)(Thuraisingham 1991, 19)

There is a strong trend toward standardization in software and for applications which can go between systems. A Multimedia PC (MPC) specification which is based on Microsoft Windows has been developed by the MPC Multimedia Marketing Council. (Ford 1992, 54) Standardization is also developing which creates compatibility between systems--crossplatform applications. These designs facilitate the convergence of nonlinear Macintosh navigation flexibility and sound quality with serial IBM (DOS) design power.

Copyright and intellectual property ownership are major concerns involved in the use of multimedia. New definitions of intellectual property rights are being written and tried in case law about such issues as appropriate descriptions of content ownership and what constitutes fair use.

Current Applications

The electronic database industry earned $11 billion of the GNP in 1991. Multimedia products are a thriving segment of this market despite the popularity of online information sources because multimedia uses lower level technology, costs less, and online is not always the most efficient working medium. (Basefsky 1992, C3) Multimedia is also a personalized medium which is accessible by any user. The medium excels as a creative tool for self publishing, and flexible adaptation to many markets. The fact that multimedia applications are used in many sectors--commercial, government, educational, and library--has led to rapid market expansion. The products which are now receiving full marketing promotion are the crossplatform tools which will enable the use of multimedia as a universal format.

THE VISION: LIFE IN THE WEB

Vannevar Bush had a vision that as a result of the memex, new generations could inherit an interconnected web of information. (Bush 1945, 108) By constructing these webs, multimedia is indeed reorganizing the social framework of information and communication into an easily transferred web of information. The effects of the use of this medium might suggest the shape of trends in the future. "The future always casts its shadows before. If we can read the shadows correctly, we gain a substantial measure of control over the future. . .we do not have to become its helpless victims." (Shay 1991, 4) Future directions relating to user characteristics, socioeconomic factors, education, and technology are of special interest to librarians for selecting appropriate resources and services to provide their users. The following paragraphs sketch a portrait of the evolving users in their information landscape.

User Characteristics

Consumers are changing in the ways they expect to use and control information. People will build personal data bases and do so from the primary ages. They will become accustomed to knowledge evolving over time and being developed in their personal data bases. For some, this will mean greater independence in obtaining self-satisfaction in information seeking. Others will experience greater alienation and helplessness in fulfilling their information needs. There will be increasing emphasis on self-publishing as an educational activity, and more people will occupy themselves with self-publishing as an avocational activity. People will use an international address as their main address, and they will receive a personal phone number at birth. (Chiles 1992, 51) Communications will be cross-class, cross-generational, and cross-cultural. Women will find themselves squeezed out of technology power groups and jolted back into object, sex symbol roles in a return of stereotypes. (Winn 1991, 2)(Cleveland 1989, 34-35) Personal imaging (image projection in the marketplace) will be increasingly important--in cyberspace and personal databases as well as "real" time. This will be the new nonverbal communication. Consumer and student attention spans will get shorter. Consumers will have higher commercial expectations.

Socioeconomic Factors

Business and education will become even more multilingual and multinational; and at the same time products will be marketed toward specialized markets of small interest groups or ethnic groups. This will be possible because of the flexibility of desktop publishing. (Naver 1992, 16) Marketing will also address "power megadollar" segments: the investment and industrial leaders termed "Gold Collar" workers who are both the greatest producers and the greatest users of information. (Shay 1991, 3)

Business reports and presentations will be in multimedia formats, often produced and published in online forums. The 1980's had word processing and spreadsheets, the 1990's will have videotel (interactive television). The location of where people do business will continue to change--moving out of traditional office sites. Information technologies make the migration from the cities and suburbs to the exurbs possible.

There will be a wider gap in information accessibility directly related to economic ability. Collaboration and networks will be used in attempts to overcome the problems of minority, economically underprivileged groups who are handicapped by the information gap. (Fitzgerald 1992, 38, 41)(Metoyer-Duran 1991, 322-26)

Rural areas in America will learn about new aspects of resource utilization and resource sharing from successful applications of CD-ROM multimedia technology in economically depressed, developing African nations. Both types of areas have information-demand populations living in areas that are information poor. (White 1992, 33) Rural areas will also take advantage of real time conferencing to overcome distance, weather, flextime and flexsite, and limited access to subject experts. Rural shopping will be shopping by videotel. The electronic yellow pages, health care information, and distance tutoring are this era's Sears catalog. (Naver 1992, 12-13) Citizens in geographically remote communities will visit town forums and vote by videotel.

The use of games and the practice of gaming will resume a strong place in the main fabric of business and educational life. Very young populations can wield influence--power and dollars--with community leaders. The glamorization and depersonalization of violence, combat, and war will continue and increase in entertainment and advertising.

Education

"To a generation raised on television, video games, and computers [multimedia] learning has. . .tech appeal." (Mimms 1992, 22) Education will return to an emphasis on the story--using storytelling as education in which the story of the software is as important as the content. We will need new ways to learn faster and methods to assimilate technology faster. (Shay 1991, 4) Changed vocabulary and experiential frameworks of knowing will change our language rapidly. Writers and editors of multimedia products will influence language through the use of inventive, colloquial vocabulary and grammar. Broader educational goals will provide professional intern experience in simulated situations. (Jones 1992, 39)

Technology and Research

Object-oriented programming research will restructure the ways we organize and access information. New computer languages will proliferate. We will redesign the navigation systems used in organizing knowledge--for books as well as media. (Shushan and Wright 1992, 36) Mapping--graphical approaches to indexing--will become three-dimensional--perhaps holographic. Information integrity--the need for multilevel security--will determine who has access to information, and will change the ways information is represented to different people. (Thuraisingham 1991, 22)

Implications for Libraries

The spheres of influence which cast shadows before them into the future cast those shadows into library functions. Library clients have been influenced by the multimedia impact on learning and information use patterns: the user's environment has changed. Libraries are competing for the "Nintendo" attention span. (Winn 1991, 2) With the increased need to promote services, librarians will need to focus the services they offer to serve selected niches and advertise appropriately. Library market positioning will be extremely important.

STRATEGIES

The effects of multimedia development suggest opportunities for librarians to develop strategies for resource management and service applications. (Table) These strategies will involve significant budget challenges. The greatest impact will be at the small community level. Lower library buying power, the need for more sophisticated computer hardware, rising user expectations and sophistication, and technologically-limited professional skills will meet in a critical mass. Choosing a course of action will enable libraries to remain effective information providers in a highly competitive market which is predominantly driven by large-scale commercial concerns. "The computer is a seductive appliance that needs to

Table I. THE IMPACT OF THE MULTIMEDIA SHIFT ON LIBRARIES

Change Influenced by Multimedia	Library Strategies:		
	Budget	Resource Management	Services
Society is global: multilingual and multicultural	Change is in itself expensive	Resource management and analysis becomes more important to budget control and service support	Visualize potential uses by patrons
Information dissemination is interactive even over distance	Libraries need more expensive data communications systems	Libraries supply more resources in all formats at greater depth and collect software and data files	Forecast, read aggressively, visit online forums, attend trade shows, scan catalogs, and visit computer stores
Multimedia is accessible to all types of users	Purchase, upgrade, and maintenance costs rise with increasing hardware capacity and frequency of use	Increasing numbers of materials available in digital format	Staff in small libraries spend more of their professional time on forecasting and product awareness activities
As multiple senses are involved, the user's ability to absorb information goes up	Choice of acquisitions strategy--separate line or incorporated -budgeting allocation for multimedia	The choice of form in relation to subject becomes a nonissue: choice of format is determined by type of use	Policy decisions between censorship vs. ensuring database and source integrity
Public expects personalized information "to go"	Financially software is more like a serial than a monograph	Include multimedia in resource development and incorporate it in the resource development policy	Libraries select their professional position in relation to other information professionals and the industry
Users expect to be able to manipulate searches and data for themselves	Licensing fees become large parts of the library budget	Define what multimedia the library will and will not collect, in what format, and whether to LAN or WAN or not	Libraries are the source of community in fragmented, varied world. Librarians are multilingual, even in small libraries
Multimedia can aid in overcoming some barriers resulting from physical or learning disabilities	Decide on free provision of expensive products to information "have nots" or fee services to information "haves"	Acquisitions staff shop supply sources and negotiate use agreements	Local, small libraries utilize technology without waiting for change to filter down from large libraries
The time lag between emerging technology and library application decreases	Greater budget commitment to staff on-the-job training and continuing education	Preservation, weeding, cataloging, and housing policies reflect use by association rather than classification	Libraries are publishers. Libraries furnish self-publishing work stations with staff assistance provided

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Table I. THE IMPACT OF THE MULTIMEDIA SHIFT ON LIBRARIES

Change Influenced by Multimedia	Library Strategies:		
	Budget	Resource Management	Services
Lines between subject areas and disciplines blur.	Pay scale adjustments to industry standards	Shareware "circle of gifts" publishing utilized as a significant information resource	Development of new, more efficient job training methods
Interdisciplinary analyses and presentations are the standard rather than single discipline research	Possible liability for unfair use of intellectual property obtained through library access channels	Materials stock is rotated within shorter periods of time	Users and service areas are fluid
Facilitation of collaborative work	Budgeting to cover information interpretative services against malpractice suits	Data files are manipulated and updated often	Staff levels increase to handle one-on-one user assistance and custom information packaging
Information ownership is blurred and fair use of intellectual property difficult to ensure or monitor	A lot of information can be obtained in a single disc title at low cost	More libraries utilize Macintosh applications and add sound and video capacity to their DOS computers	Libraries are research institutes in information mapping and relevance, question analysis, information transfer
Much technology is designed for the market of single users	Less public sympathy with library budget requests	Use of both Macintosh and DOS based products in most libraries	Information conveyed through the senses is believable. Clients need librarians as interpreters
		Librarians operate and maintain sophisticated software and hardware	Library technicians provide much skilled user interface, installation, maintenance, and information handling
		Specialized preservation technology research is needed	Clients used to animated representational modes not satistied with more traditional formats
		Reciprocal borrowing and resource sharing are increased	User frustration in clients expecting to access and use other information formats as easily as multimedia

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be regulated carefully. . .it's awesome. It can also be absolutely paralyzing in the absence of intention." (Nuwer 1992, 19) There is still no substitute for going back to the basics of marketing library services and practicing resource management.

Marketing and Resource Management

The promise is the ability to turn the computer from a simple productivity tool into a complete information resource which allows one to steer interactively through information presented in sights, sounds, and text. The challenge is to do so without getting mired in hardware/software incompatibilities and without running out of dollars. (Ford 1992, 54)

We are producing such prodigious quantities of data at such high velocity that it is physically impossible for us to continue to utilize print as our main medium. However, we still handle our electronic inventory in its relationship to our service objectives as if it were another kind of print format. By being visually oriented and more accessible to our sensory manipulation, multimedia packages may impel us to think of information in access, utilization modes rather than as pieces or cards of data frozen in time. The parameters of reference services and collections may blur together. Reference services may become information accessing and packaging services. It may be less simple to segregate "fiction" from "nonfiction," or "reference" from "general use" or "entertainment" resources.

It is helpful to understand that professional information service is the value-added product that libraries have to purvey. Librarians have the skills to access and manipulate data, analyze questions and data, to package data and data access, and to draw inferences and connect the information to the patron.

There is as long a list of issues related to assimilating multimedia technology in libraries as there are work activities in the library, but knowing our merchandise and knowing our customers are the issues of priority. Resource selection decisions still use good selection criteria. (Seiden 1991, 23-24) Use your own imagination about ways the patrons might use software: visualize uses. Include all software in the resource development policy (Figure 2) and in resource evaluation. (Seiden 1991, 33 and 35) Tackle the challenges, such as use and purchasing, one at a time. Expect acquisitions of multimedia to be less routinized than other library materials. Staff must find sources and the best price rather than use one distributor, and negotiating software use agreements sometimes is necessary.

The important point for success in maintaining relevance to our users is library recognition of the mainstream impact of multimedia technology and identification of the appropriate role for this resource in providing patron service at a local level. Even when a library decides not to provide resources based in multimedia technology, provision of other resources and services will be changed to suit consumers' information use expectations.

Librarians as Participants in Multimedia Information Synergy

Librarians' skills are the greatest value libraries have to offer. In today's working environment of information synergy, information-demand users will rely

How multimedia products meet the needs of our clientele

Data currency and validity

Product durability and replaceability

Cost in relation to amount of use (reference or entertainment)

Circulation ease

Compatibility with library hardware and software

User support

Planned updating

Figure 2. Selection Criteria for Multimedia Product Evaluation

on the assistance of information professionals to efficiently access and interpret information resources.

Any product based within a hyperstack environment can give an illusion of understanding because of the relational organization built into the environment. The exciting possibility for librarians and educators is to provide resources and guidance that enable the user to discern between the illusion of understanding in the multimedia environment and the actual achievement of understanding.

Multimedia may help us to know (to apprehend immediately with the mind or senses), but will it help us to achieve closure with understanding (the power to make experience intelligible)? Is assisting the achievement of closure with understanding an appropriate role for librarians? What is the appropriate role for libraries in the provision of a diversity of source information? Is that role to be in assuring patrons access to a variety of information formats and information seeking pathways? Do libraries have a responsibility to assure the veracity or validity of source information?

Multimedia is connected to and affects our ways of knowing. In the shift away from a role which has often been played as The Library which maintains The Collection, The Librarian and Library Service assume primary importance for connecting patrons to resources in socioeconomically relevant ways. Users in the web of information need librarians to help them successfully navigate the web.

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APPENDIX 1
TYPES OF MULTIMEDIA SYSTEMS

Hypermedia

1. Links information together, creates paths
2. Similar to concepts of hypertext but includes sound, video, spreadsheets, etc.
3. Information is stored in modular nodes connected by links into a network.
4. Moving through the network by activating the links is called navigation.

Multimedia Database Systems

1. Like contemporary database systems for textual and numeric data.
2. Also deal with a variety of media materials.
3. Multimedia discs combine random access with multimedia.
   a. 4 leading standards for optical discs
      video disc
      CD-ROM
      CD-I (compact disc interactive)
      DVI (digital video interactive)
   b. Difference is in the encoding format:

analog	vs.	digital
video disc		CD-ROM
		CD-I
		DVI
unsuitable for PC editing		

   c. Large capacity storage media

Multimedia Message Systems

1. Like contemporary electronic mail and conferencing systems.
2. Also accommodate a variety of media.

Virtual Reality Systems

1. Immerse user in simulated world by including movement and tactile control.
2. Users interact in manners imitative of real world.

Intelligent Agent Systems

1. System has assigned, non-directive responsibilities of its own.
2. Has ability to "learn" and to refine a search.
3. Highly interactive.

APPENDIX 2

COMPARISON OF MULTIMEDIA AND PRINT

Multimedia Strengths	Print Weaknesses
multisensory	single sensory channel
nonlinear	fixed, linear presentation sequence
highly interactive	noninteractive
edit oriented	lacks built-in editing tools
multiuser environment	single user environment

TEACHING TECHNOLOGICAL SKILLS IN THE LIBRARY SETTING: A TRAINER'S PERSPECTIVE OF THE PROCESS, THE CHALLENGE, AND THE STRATEGIES

Paul S. Hoffman

Nebraska Library Commission

Lincoln, Nebraska

ABSTRACT

As technology has grown in its sophistication, complexity, and application to library services, the responsibilities and importance of the trainer have increased accordingly. It is often not enough that trainers in the library setting know "the material"; the scope of their expertise must extend to a familiarity of the institution being trained, an understanding of the current technological developments and trends in the information profession, and interpersonal skills to accommodate the vagaries of training across a broad field of experience and expectation--often concurrently. Planning, preparation, participation, preview, prudence, and patience are categories under which the trainer can develop useful skills and strategies to meet these challenges. The result: training sessions which provide technical detail, personal satisfaction, and promote both understanding and integration of the skills being taught.

Technology can be considered a scientific method of achieving a practical purpose. *Training* involves some form of instruction designed to increase the proficiency of an individual in some task. Trying to ensure that the former--an often sterile and seemingly inflexible environment--is adequately explained via the latter--an interpersonal setting in which experience, emotions, and a host of other variables must be taken into account--has been one of my greatest challenges at the Nebraska Library Commission over the past three years. As the OCLC Member Services Coordinator, I've been charged with providing training and support for OCLC products and services to both professional and non-professional staff in multi-type libraries. My position has enabled me to experiment with a variety of approaches to training, and learn from my successes (and occasional stumbles).

In his article, "Introducing Staff to Change," Greg Byerly examines mechanisms for dealing effectively with the changes caused by the introduction of automation and other technologies in libraries; and he presents guidelines which consist of "six points to positive progress: planning, participation, preparation, preview, patience, and prudence." (Byerly 1990, 39) With the change of one point--that of prudence to pragmatism--I find these categories equally applicable (and practical) to the task of instructing librarians in areas of technology. Tempered with personal experience and observations, what follows are adaptations of these categories to training issues, strategies, and cautionary tales.

Satisfying the information needs of the community may be the life's blood of our profession; but, increasingly, technology is the pump that drives it. And, as a growing wave of high technology washes across our personal and professional lives, change is the one predictable result. As such, the trainer needs to know his or her subject, the audience, **and** try to narrow the gulf which often exists between the two. How is it done? First, there's...

Planning

It's been my experience that the preparation of technology-intensive training materials is as challenging to the trainer's ingenuity, knowledge of the subject, (and occasionally stamina) as the actual session. In planning, "knowing the material" is simply not enough; the process must also take into consideration the nature of the audience and, often, the training location. The planning process requires a variety of questions to be considered: What level of technology is already in place in the library? What range of technical experience am I likely to encounter? How might this color the attitudes of the participants? Will the existing documentation meet the needs of the class? Must it be augmented by specially prepared materials? What opportunities and constraints does an off-site location present for training? And so on. Each answer helps the trainer focus on the length, thoroughness, materials, and subsequent support a given session will require.

Participation

I'm of the "It's not the mountain in the distance that wears you down, it's the pebble in your shoe" school. Which is to say that the highest hurdle to be overcome in a technology-intensive workshop--especially for those with limited exposure--is not in addressing the vagaries of its eventual use, or even in encouraging participants to discover the opportunities and expansion of services a given technology offers. It means helping trainees get comfortable with the idea of *using it* through sessions that offer opportunities for participation.

Most of my training sessions address this element of instruction by providing hands-on exercises (which usually take the form of some kind of online activity). I also pose questions throughout each session, constantly solicit feedback, try to provide "real life" applications and examples, encourage experimentation, practice empathy (haven't we all been in a similar situation at one time or another?), and try to inject an element of fun into what can often be dry subject matter.

While an understanding of the framework--both institutional and global--into which a given technology fits is important, in order to manage time constraints I prefer to minimize theory and place the emphasis on a learning-by-doing approach. The benefits can be immediate and long-lasting: existing anxieties are reduced, and both competence and confidence levels grow. Frequently, I will have two participants work together on session exercises. As a result, one or both individuals can learn from the other's feedback, experience, problem solving skills, and insightful "aha's."

Feedback in the form of training evaluations permit a final and important opportunity for participation, the written comments often providing constructive criticism useful in refining future training sessions.

Preparation

In any formal instruction, particularly where technology is involved, training materials should be a reflection of the instructor's objectives. Without this keystone firmly in place, the whole structure of a session is in danger of collapsing. It's the training objectives that define the tools the instructor will need and the way they will be used. They are the core of preparation--the advance, behind-the-scenes activity which helps ensure relevant and effective training.

I place a strong emphasis on having my presentation and training materials appeal to audio, visual, and what I call kinesthetic modes of learning. Simply put, this means creating an environment in which the information needing to be learned can be heard in the presentation and discussion, seen in the materials and overheads provided, and made further accessible to the sensory experience through hands-on opportunities.

I'll often pull together hand-outs and quick-reference charts, glossaries, print and online examples, overheads, even occasional illustrations. Some of these materials may need to be created in-house to fit special needs, but they need not be elaborate creations. For certain workshops, I will send out--in advance of the session--materials highlighting the topic and its companion terminology, as well as an informative "Question & Answer" section.

These tools only represent the physical aspect of preparation. Equally important is familiarity with the audience and the environment in which they work. Understanding an institution's technical needs, concerns, goals, and accrued experience complements the materials to be used and lays the foundation upon which an effective training session is built.

Preview

I think of this as the "shape of things to come." Putting it less dramatically, preview refers to demonstrating the featured technology. A measured, step-by-step introduction provides participants an opportunity for questions and, for some, a welcome bit of time to prepare for easing another aspect of technology into their lives.

Previewing also permits reality checking, that is, allowing the trainer to gauge--through participant query and reaction--his or her success at communicating the concepts and perform any necessary "fine tuning."

Finally, the preview period allows the trainer a chance to exhibit some of his or her own "humanity." A sense of humor, personal perspective, even a little fallibility on the part of the instructor can go a long way toward personalizing the training experience.

Patience

It must sometimes seem to librarians as if they've set foot on a spinning merry-go-round of mechanization--a ride featuring a brass ring that gets harder to grab (and sometimes discern) with each technological revolution. Ours is a profession in which sophisticated and sometimes divergent technologies follow on the steps of each other, each impacting in some manner the way we work. Not surprisingly, people bring far more to training sessions than notepaper and pens--they bring their curiosity and biases, their anxieties and expectations. The trainer must be prepared to deal with these emotional responses and, therefore, recognize the impact the technology being presented has on both an institutional and personal level.

Patience--which is indeed a virtue in any kind of teaching--is critical if the trainer is to accommodate the range of audience experience and attitudes. Patience provides a session in which pacing is governed first by the level of understanding the participants display and second by a formal agenda.

Empathy, tenacity, listening skills, humor, and flexibility are additional tools the trainer must employ to lessen the gulf between technology and the mixed feelings it rouses in many of us.

Pragmatism

It's the metamorphic nature of technology which makes its instruction such a challenge. Each new technological incarnation in our libraries seems to bring companion changes in routines, commands, connectivity options, upgrades, scheduling, and a host of other minutiae which accompany that which is at the heart of our profession: *constant* (and often complex) *change*. For the trainer, pragmatism is a principle that provides little room for assumptions that each participant is ready to apply and integrate new skills into his or her workflow; that each institution continues to monitor the technological continuum, or that the agenda of a workshop is immutable. Pragmatism is **not** cynicism--to the contrary, it encourages the trainer to develop those creative and interpersonal skills which allow tempering the training goals with the reality of the setting and the audience. It means flexibility in training style and continued support, allowing room for mistakes and encouraging experimentation. To the greatest degree, it means focusing less on technical mastery as the training target, and more on promoting a level of comfort with the tools and a recognition of how they benefit the growth of what the library truly is: a *service*.

In the end, these six points of positive progress provide a productive training experience by creating an environment in which the following flourish:

Curiosity--that which intrigues us or appeals to our own self-interest also stimulates a desire to know more.

Relevance--providing instruction which has direct and demonstrable applications to the participant's needs and responsibilities.

Confidence--developed through exercises, feedback, demonstration, and continuing support.

Finally, **satisfaction**--an often overlooked component of training. Satisfaction comes as a result of identifying portions of training which supply intrinsic rewards like pride of accomplishment, or extrinsic ones such as greater responsibility and competence.

A Final "P": Perpetual

In a field as sensitive to the tremors of technology as ours, training, continuing education, honing skills, keeping pace with the field--whatever phrase you choose--becomes crucial. On-going training is an investment in the vitality of both the institution and employee; it must be regarded by both as a **perpetual** responsibility if we wish to continue to offer vital and responsive information services into the next century. When effectively presented, the personal growth and professional development such training provides can be--for the trainer and trainee--both a worthwhile challenge and a reward of working in the information profession.

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CELS: Electronic Library Services at the Creighton University Health Sciences Library

by

Richard Jizba
Creighton University Health Sciences Library

Aware of the desirability of providing electronic access to its mediated services, the Creighton University Health Sciences Library developed CELS: Creighton Electronic Library Services. Using CELS faculty and staff can request library services from their office or home computers. When appropriate, CELS may used to to retrieve the response to their request. CELS runs under the Unix operating system on a 33 MHz 80386 DX computer. The features of CELS, the rationale for its development, and the advantages of Unix for this application are discussed.

If academic libraries are now very automated, and librarians and faculty use computers daily, why don't faculty and librarians communicate electronically?

When the staff in the Reference Service of the Creighton University Health Sciences Library asked themselves this question, the answer was apparent: they would, if they could. Since there weren't any off-the-shelf systems tailored to the kind of electronic communications envisioned by the HSL staff, they decided to make their own. The system they developed is called CELS: Creighton Electronic Library Services.

CELS allows users to request reference assistance, computer searches, drug information services, photocopying and interlibrary loan services from their office or home computer. When appropriate, they can pick up the response to their request electronically.

For example, a faculty member may access CELS from his office computer and request a literature search. Later he could access CELS again and download the information to a file on his computer. Then any useful references could be added to his personal bibliographic database, or extracted and transmited to CELS as a photocopy request.

All of these transactions could take place using a campus wide electronic mail system. A system such as CELS isn't really necessary -- in fact, CELS depends on electronic mail as its message handling system. CELS main purpose is to provide an interface to the electronic mail system. The interface has two features: menus and input forms. The menus provide a list of services available through CELS and call the appropriate input form when the user wants to make a request. The input forms ensure that the user provides all the information the library staff needs to process the request.

CELS isn't just a glorified electronic mail system. It also includes two small databases. Future plans call for adding a news feature.

One important consideration for a system like CELS is how to quickly notify library staff when a request has been submitted. For reference, computer search, and drug information requests, CELS notifies the Reference Service immediately upon the receipt of the request. CELS continues to alert the staff every 10 minutes until they read and begin processing the request.

CELS is not unique. Other libraries have developed similar systems. ICSLine is an in-house system developed at the Information Services Center of Cetus Coprporation in Emeryville, California (Handman, 1991). ICSLine runs on a VAX computer. Pauline Hodges (1989) has described another in-house system for requesting services from the Chemical Abstracts Library (CAS). The CAS Library system runs on Unix. Like CELS, both systems provide users with a menu interface and request forms.

Features of CELS

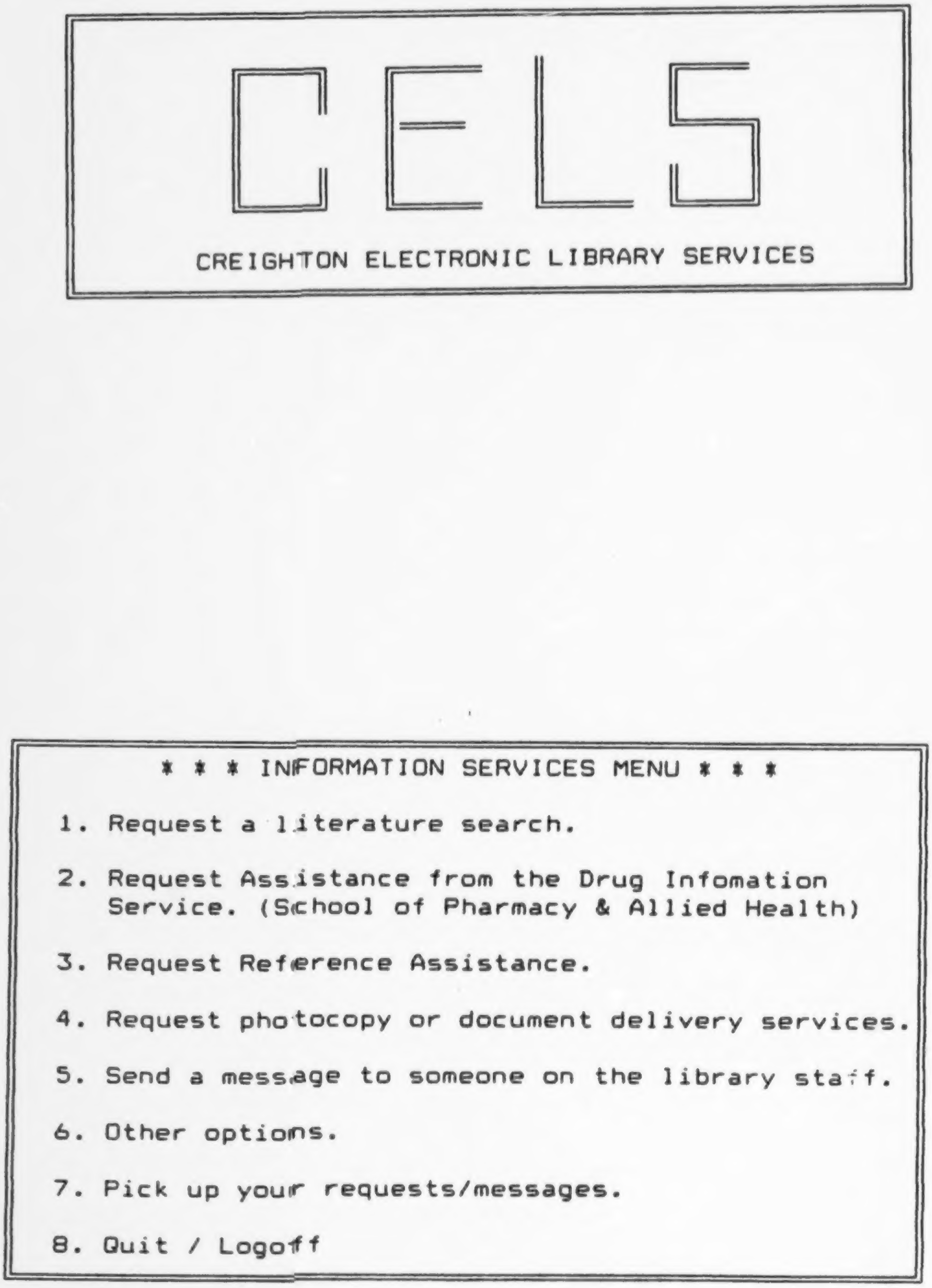
The major features of CELS are listed on the opening menu (figure 1).

"Request a literature search" is the first option on the opening menu. When this option is selected, another menu is presented to the user. From this menu the user indicates if the request is for a subject search or an author search (figure 2). After selecting the type of search, an appropriate input form is displayed and the user may enter a request. Figure 3 provides a sample input form for a subject search request.

When the input form is displayed, the users' name, department, phone number, status and e-mail identification are automatically included on the form. In addition, some parts of the request are filled in with a default answer. These default answers are provided for those questions asking about general restrictions on the search: English language only, human only, etc..

When the user has completed the form, the information is transferred to a file and the file is

Figure 1: CELS banner and opening menu.



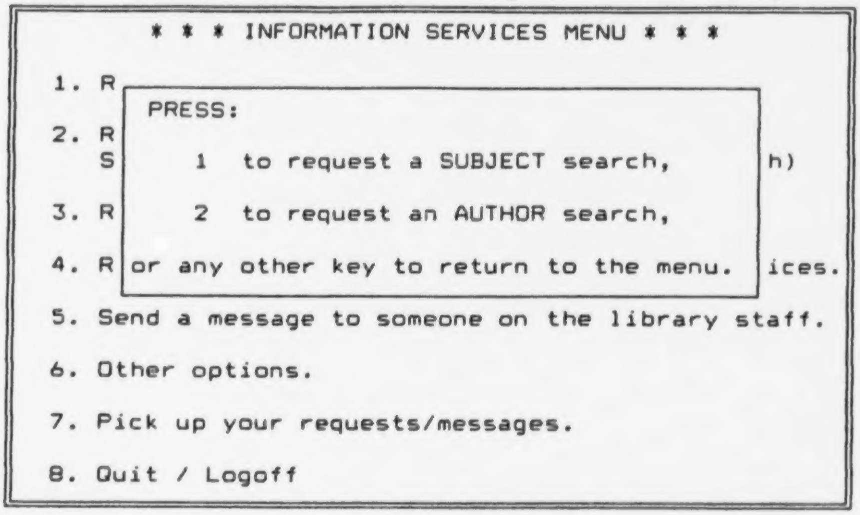
CELS

CREIGHTON ELECTRONIC LIBRARY SERVICES

* * * INFORMATION SERVICES MENU * * *

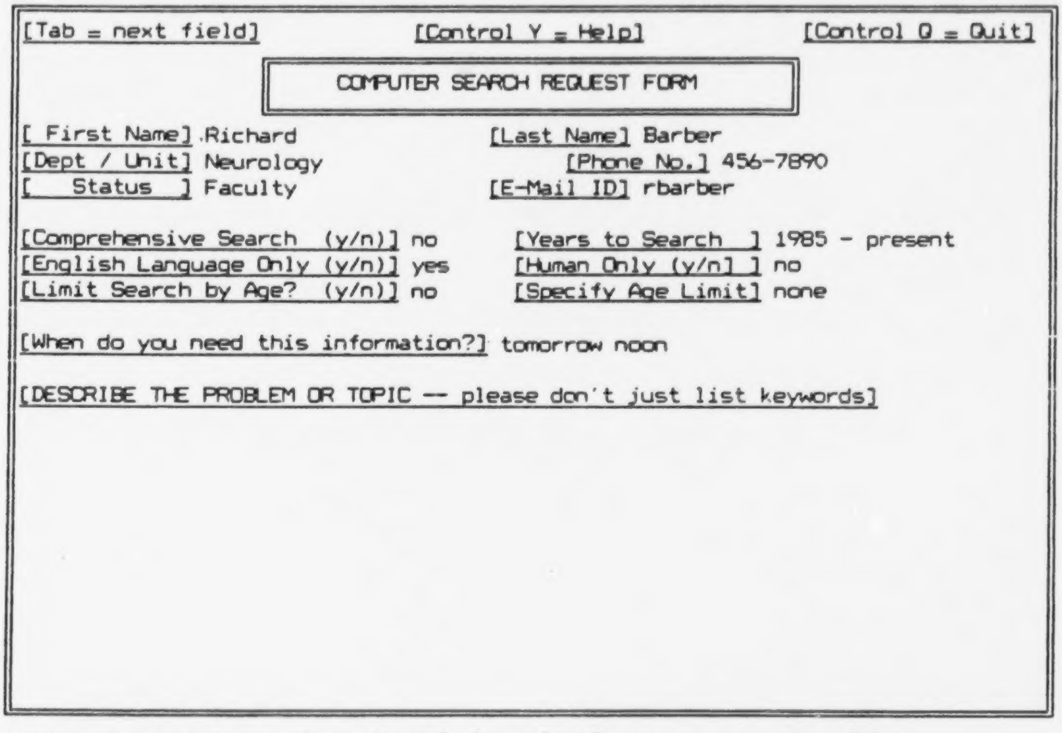
1. Request a literature search.
2. Request Assistance from the Drug Infomation Service. (School of Pharmacy & Allied Health)
3. Request Reference Assistance.
4. Request photocopy or document delivery services.
5. Send a message to someone on the library staff.
6. Other options.
7. Pick up your requests/messages.
8. Quit / Logoff

Figure 2: Option menu for computer search requests.



```
              * * * INFORMATION SERVICES MENU * * *

   1. R ______________________________________________
        | PRESS:                                      |
   2. R |                                             |
      S |     1  to request a SUBJECT search,         | h)
        |                                             |
   3. R |     2  to request an AUTHOR search,         |
        |                                             |
   4. R |or any other key to return to the menu.      | ices.
        |_____________________________________________|
   5. Send a message to someone on the library staff.

   6. Other options.

   7. Pick up your requests/messages.

   8. Quit / Logoff
```

Figure 3: Input form for a subject search request.



```
[Tab = next field]             [Control Y = Help]              [Control Q = Quit]

                         COMPUTER SEARCH REQUEST FORM

[ First Name] Richard                    [Last Name] Barber
[Dept / Unit] Neurology                       [Phone No.] 456-7890
[   Status  ] Faculty                    [E-Mail ID] rbarber

[Comprehensive Search  (y/n)] no          [Years to Search  ] 1985 - present
[English Language Only (y/n)] yes         [Human Only (y/n) ] no
[Limit Search by Age?  (y/n)] no          [Specify Age Limit] none

[When do you need this information?] tomorrow noon

[DESCRIBE THE PROBLEM OR TOPIC -- please don't just list keywords]
```

Note: brackets and underlining indicate reverse video.

then sent to the Reference Service as an e-mail message. After the request is sent, a notice that a request is waiting is displayed on the terminal at the Reference Service Station. This message is sent every ten minutes until the Reference Staff read the request and remove it from the electronic mail system.

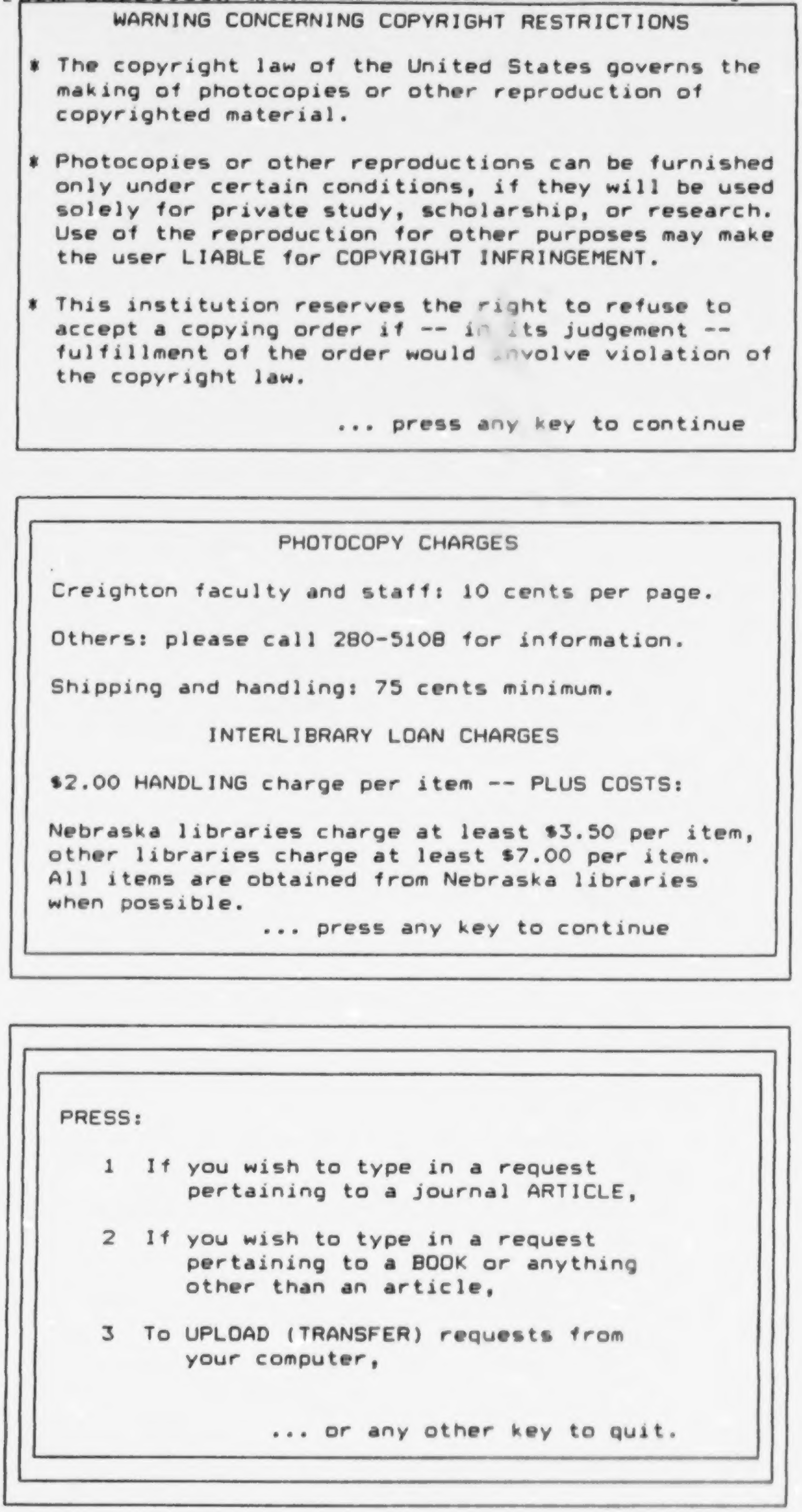
"Request assistance from the Drug Information Service" is the second option on the opening menu (figure 1). The Creighton University Drug Information Service is managed by faculty in the Department of Pharmacy Practice and staffed by students in the PharmD program. The Drug Information Service provides in-depth answers to questions from health professionals on drug efficacy, administration, side effects, interactions and many other topics. When the user selects this option a form is displayed which is similar to the form for the literature search request shown in figure 3. This request is then sent via electronic mail to the Drug Information Service. Notification that a drug information request has arrived is sent to the terminal at the Reference Service Station. The Reference Staff then notify the staff in the Drug Information Service that a request has arrived.

"Request Reference Assistance" is the third option on the opening menu (figure 1). This option is the "catch-all" option for any request for information which isn't a request for a literature search or for drug information. The user is provided with an appropriate input form and the Reference Staff is notified as soon as the request is sent.

"Request Photocopy or Document Delivery Services" is the fourth option on the opening menu (figure 1). When this option is selected the user is presented with two informational windows and then another option menu (figure 4). The first informational window is a copyright notice. After the copyright notice is displayed and the user presses a key to continue, the next window displays fees for document delivery and photocopy services. Finally the user is asked to identify his request as pertaining to an article or book, or to indicate if the citations will be transferred from a file on his computer.

If the user will not transfer the requests from his computer, an appropriate input form is displayed. If the user indicates he will transfer the citations from his computer, he is provided with an input form to

Figure 4: Copyright window, Fee window, and input form selection menu. The windows are overlayed.



```
WARNING CONCERNING COPYRIGHT RESTRICTIONS

* The copyright law of the United States governs the
  making of photocopies or other reproduction of
  copyrighted material.

* Photocopies or other reproductions can be furnished
  only under certain conditions, if they will be used
  solely for private study, scholarship, or research.
  Use of the reproduction for other purposes may make
  the user LIABLE for COPYRIGHT INFRINGEMENT.

* This institution reserves the right to refuse to
  accept a copying order if -- in its judgement --
  fulfillment of the order would involve violation of
  the copyright law.

                       ... press any key to continue
```

```
                  PHOTOCOPY CHARGES

Creighton faculty and staff: 10 cents per page.

Others: please call 280-5108 for information.

Shipping and handling: 75 cents minimum.

             INTERLIBRARY LOAN CHARGES

$2.00 HANDLING charge per item -- PLUS COSTS:

Nebraska libraries charge at least $3.50 per item,
other libraries charge at least $7.00 per item.
All items are obtained from Nebraska libraries
when possible.
                ... press any key to continue
```

```
PRESS:

    1  If you wish to type in a request
           pertaining to a journal ARTICLE,

    2  If you wish to type in a request
           pertaining to a BOOK or anything
           other than an article,

    3  To UPLOAD (TRANSFER) requests from
           your computer,


                  ... or any other key to quit.
```

input his name, department, phone number, etc.. Then he is prompted to begin the transfer of citations from his machine. The forms for all three options require the user to provide an account number or indicate how charges are to be handled.

Because document delivery requests are not seen to be as urgent as a request for information, no notice is given when a document delivery request is received. Designated library staff check the document delivery electronic mail mailbox several times each day for requests.

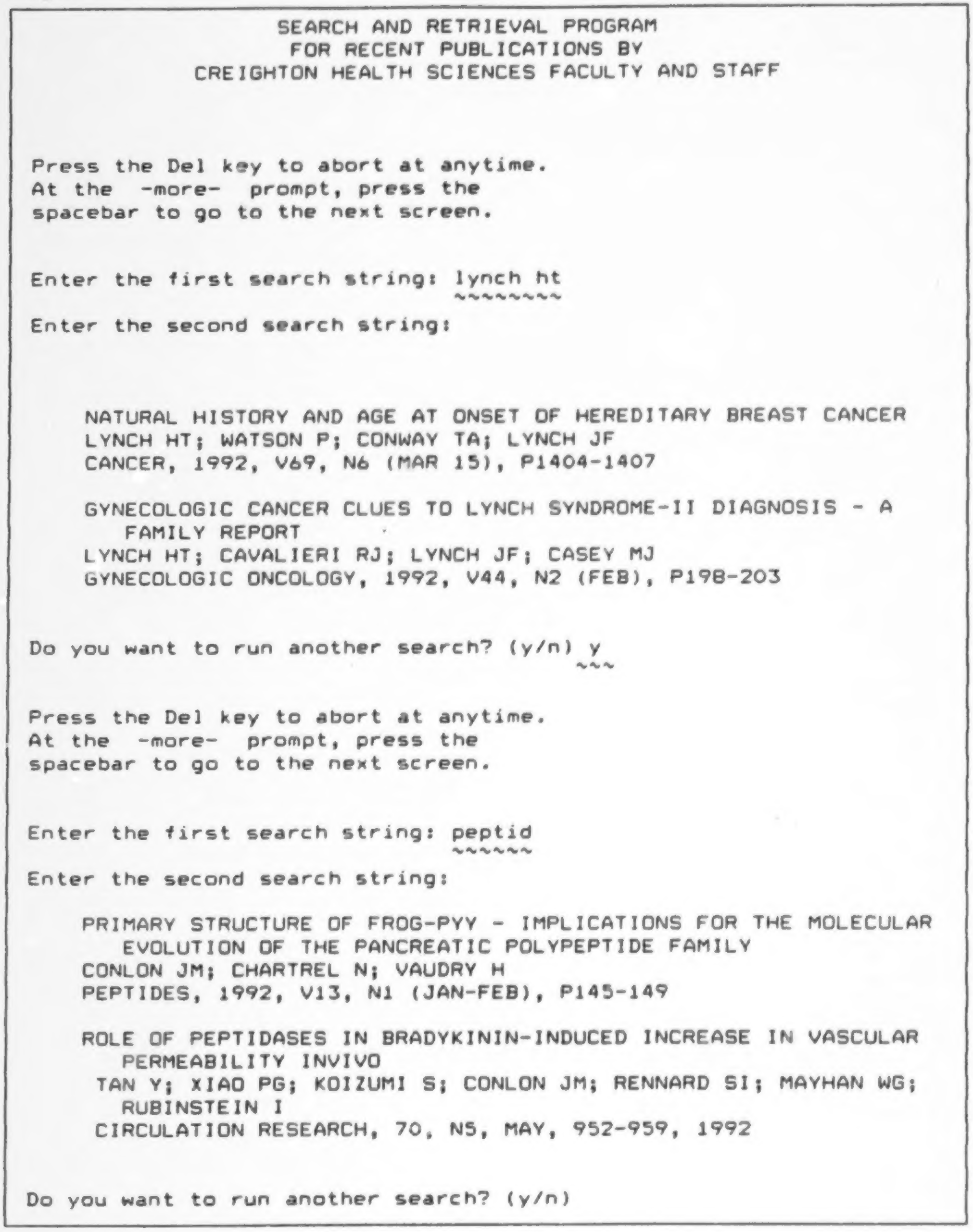
"Send a message to someone on the library staff" is option 5 on the opening menu (figure 1). This option allows the user to send an e-mail message to someone on the library staff. The user is provided with a list of staff members and their user names -- which is needed for addressing e-mail. This option may be used to send a request to the acquisitions or serials department.

"Other Options" is option 6 on the opening menu (figure 1). Only two additional options are currently available. Both options allow the user to search small in-house databases. The first database is a listing of publications by faculty and staff in the health sciences programs at Creighton University. The second database is a directory of licensed physicians in Nebraska.

These databases are small text files. The files will contain no more than 3000 records and the record sizes range from 50 to 350 characters. Each record is one line long. Records are retrieved using a Unix string search program called grep. Searching is limited to one or two "strings". A string may be all or part of a word or name. When two strings are searched both strings must be present in a record for it to be retrieved. The process imitates a Boolean AND operation. Before records are displayed they are reformatted for readability. The reformatting is done using another Unix program called awk.

The search program for articles by Creighton University authors is shown in figure 5. The first search is for papers by Dr. Henry T. Lynch. The string specified was "lynch ht" which follows the format used for author names in the MEDLINE database. The second search demonstrates the use of a word fragment to perform a simple subject search. The string used is "peptid". Two records where retrieved. The word

Figure 5



```
                    SEARCH AND RETRIEVAL PROGRAM
                    FOR RECENT PUBLICATIONS BY
               CREIGHTON HEALTH SCIENCES FACULTY AND STAFF


Press the Del key to abort at anytime.
At the  -more-  prompt, press the
spacebar to go to the next screen.


Enter the first search string: lynch ht
                               ~~~~~~~~
Enter the second search string:



    NATURAL HISTORY AND AGE AT ONSET OF HEREDITARY BREAST CANCER
    LYNCH HT; WATSON P; CONWAY TA; LYNCH JF
    CANCER, 1992, V69, N6 (MAR 15), P1404-1407

    GYNECOLOGIC CANCER CLUES TO LYNCH SYNDROME-II DIAGNOSIS - A
       FAMILY REPORT
    LYNCH HT; CAVALIERI RJ; LYNCH JF; CASEY MJ
    GYNECOLOGIC ONCOLOGY, 1992, V44, N2 (FEB), P198-203


Do you want to run another search? (y/n) y
                                        ~~~

Press the Del key to abort at anytime.
At the  -more-  prompt, press the
spacebar to go to the next screen.


Enter the first search string: peptid
                               ~~~~~~
Enter the second search string:

    PRIMARY STRUCTURE OF FROG-PYY - IMPLICATIONS FOR THE MOLECULAR
       EVOLUTION OF THE PANCREATIC POLYPEPTIDE FAMILY
    CONLON JM; CHARTREL N; VAUDRY H
    PEPTIDES, 1992, V13, N1 (JAN-FEB), P145-149

    ROLE OF PEPTIDASES IN BRADYKININ-INDUCED INCREASE IN VASCULAR
       PERMEABILITY INVIVO
     TAN Y; XIAO PG; KOIZUMI S; CONLON JM; RENNARD SI; MAYHAN WG;
       RUBINSTEIN I
     CIRCULATION RESEARCH, 70, N5, MAY, 952-959, 1992


Do you want to run another search? (y/n)
```

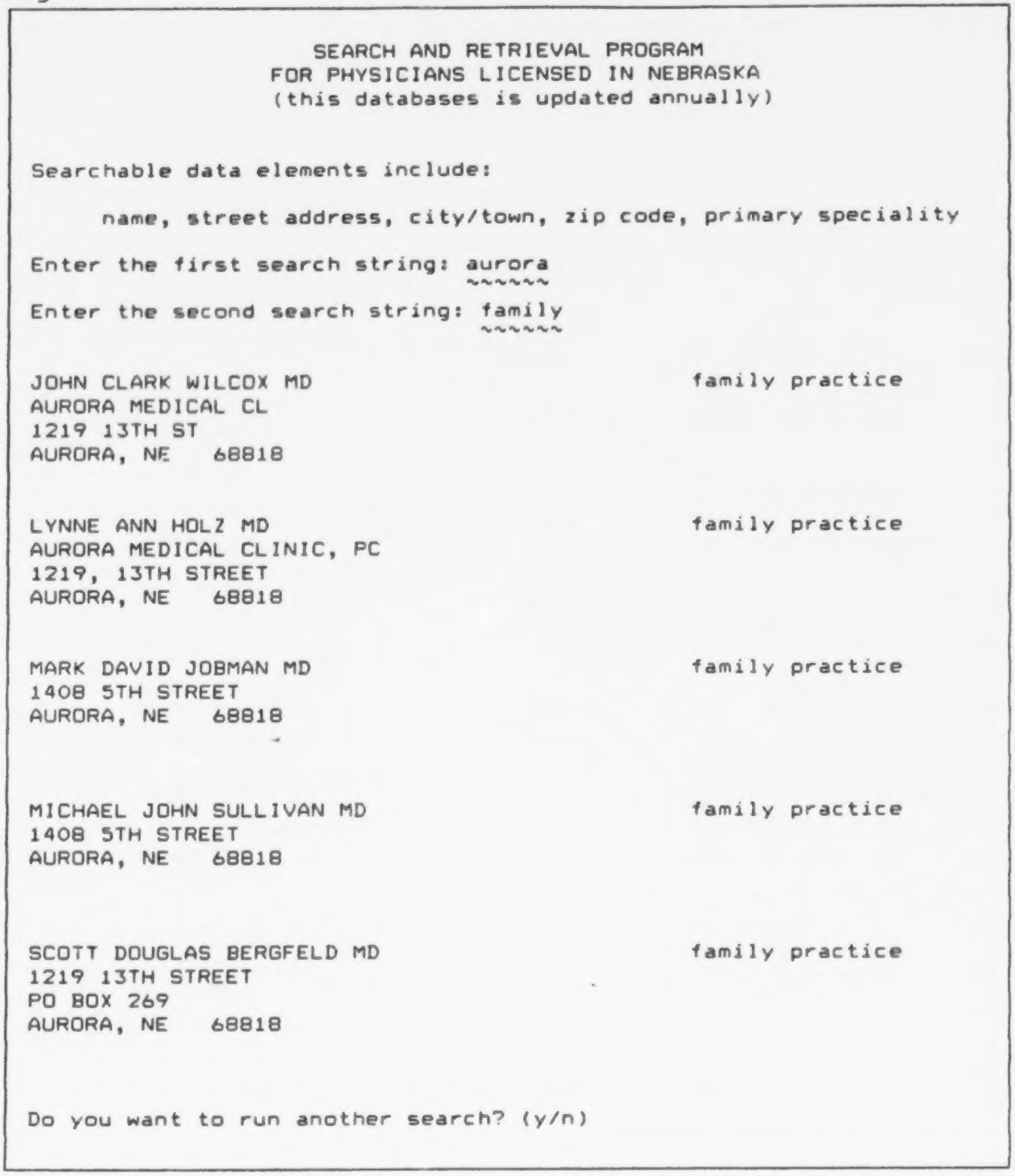
BEST COPY AVAILABLE

polypetide occurs in the title of the first record and the word peptidases occurs in the title of the second. Both words contain the string "peptid".

The search program for locating addresses of physicians licensed in Nebraska is shown in figure 6. Searches may be performed using using physicians' names, street address, city or town, zip code, or primary specialty. In the example in figure 6, the search was run to find family practice physicians in Aurora, Nebraska. The records are formatted so they may be easily transferred to mailing labels.

"Pick up your requests/messages" is option 7 on the opening menu (figure 1). When this option is selected a program checks to see if the user has mail. If there is no mail the user is informed and then returned to the opening menu. If the user does have mail, CELS runs the Unix mail program. The user may then read and dispose of his mail. Before the mail program is invoked the user is asked if he wants his mail messages to be displayed a screen at a time or if long messages should scroll continuously. This option was added to facilitate the downloading of mail to the users pc. Continuous scrolling is preferred for

Figure 6



```
                  SEARCH AND RETRIEVAL PROGRAM
              FOR PHYSICIANS LICENSED IN NEBRASKA
               (this databases is updated annually)


Searchable data elements include:

     name, street address, city/town, zip code, primary speciality

Enter the first search string: aurora
                               ~~~~~~
Enter the second search string: family
                                ~~~~~~

JOHN CLARK WILCOX MD                            family practice
AURORA MEDICAL CL
1219 13TH ST
AURORA, NE   68818


LYNNE ANN HOLZ MD                               family practice
AURORA MEDICAL CLINIC, PC
1219, 13TH STREET
AURORA, NE   68818


MARK DAVID JOBMAN MD                            family practice
1408 5TH STREET
AURORA, NE   68818


MICHAEL JOHN SULLIVAN MD                        family practice
1408 5TH STREET
AURORA, NE   68818


SCOTT DOUGLAS BERGFELD MD                       family practice
1219 13TH STREET
PO BOX 269
AURORA, NE   68818


Do you want to run another search? (y/n)
```

downloading.

Access to CELS

Users may access CELS through a dial-in modem or through JayNet, Creighton's campus network. The network protocol used by the Unix machine running CELS is TCP/IP. Since JayNet is linked to the InterNet, CELS may be accessed by anyone in the world with InterNet access who has received a CELS user name and password. Dial-in users may access CELS at 1200 or 2400 baud.

CELS administration.

CELS is not a public access service. People wanting access to CELS must contact the Reference Service in order to receive a user name and password. CELS is generally restricted to faculty and staff. It is not intended for student use.

Only the Unix administrator may added new users. After adding the user to the system the administrator must then modify the user's login profile for CELS and add a client file to the user's home directory. This file lists the user's name, phone number, department, status, and other information which is used by the various CELS input forms (figure 3).

Since CELS is a program running under the Unix operating system, the CELS administrator should be the Unix system administrator. Unix system administration requires training and experience. It is possible to learn Unix administration by reading books on Unix, the Unix Administration handbooks which come with the operating system, and by trial and error. This author is a self taught Unix administrator. Being a Unix administrator is probably comparable to being an administrator of a local area network.

UNIX

CELS was implemented on a Unix system for a number of reasons. First, Unix is a multiuser and multitasking operating system. Because Unix is a multiuser system several people may use CELS simultaneously. At the same time the library staff may be using the machine for other purposes. The number of simultaneous users on a Unix machine is limited only by hardware considerations: the amount of RAM; the number of ports available for terminals, dial-in access, or network access; and the processing speed of the computer.

Multitasking refers to the operating system's ability to run programs simultaneously. Since Unix supports multiple simultaneous users it must be multitasking. In addition its multitasking features allow users -- particularly the administrator -- to run programs in the background. CELS uses a background program to check the reference service's mailbox and notify the staff whenever mail arrives.

The Unix operating system runs on many different kinds of computers -- from 80386 PCs to super computers. This is another key advantage of Unix. Because Unix runs very well on 80386/80486 based computers, a small library which qualifies for educational software pricing can install a Unix System for about $7,000. The minimal hardware requirements for a small Unix system are: a 33 MHz 80386 DX computer, 8 MB of RAM, 200 MB of disk storage, a multiport adapter (to expand the number of serial ports for terminals and modems), and a couple terminals and modems.

Another advantage of Unix for applications like CELS is its utilities for manipulating text files. Using the awk and grep utilities mentioned earlier, anyone with experience in Unix Shell programming can develop simple but effective database programs in one or two hours. Unix shell programming is very simple -- anyone who can write simple BASIC programs should be able to write Unix shell programs.

The Unix communications utilities are also used to advantage by CELS. CELS uses the Unix electronic mail system to move messages between the library staff and CELS users. Unix also allows users to write messages on each other's terminals. This utility is called 'write' and it is used by CELS for sending the initial notice that a request has been received.

Unix is a logical platform for a service such as CELS. Since the Unix operating system is often found on college and university campuses, librarians should be able to find support within their institutions for implementing and administering a Unix system. On many campuses, it may be possible for the library to implement a service like CELS on an existing machine. If this is possible, then someone else will probably perform the Unix administration.

Final Remarks

It isn't possible for everyone to do their own information retrieval. They may not have the time or the expertise required to do an effective search. It may simply be a geographic problem: they may work off-campus. These are the barriers faced by many faculty in the Health Sciences programs at Creighton University. In response to this situation, the Health Sciences Library provides many mediated services to its faculty: from photocopying to free computer searches. While these services are convenient, the Library has sought to make them more accessible and more convenient. This was one motivation behind the development of CELS.

Another rationale for CELS is to highlight the expertise found among the staff in the Health Sciences Library and to encourage the faculty to use it. Who is more thorough and more effective at information gathering than the reference staff? Who has greater expertise in drug information than the faculty in the Drug Information Service? It is the Library's responsiblity to ensure that the Creighton Health

Sciences community takes full advantages of the human resources in the Library.

The final rationale for the development of CELS was to keep information in computerized form. Why print information from a computerized database only to have someone retype it into a word processing file, or transfer the information to a photocopy request form? It makes sense to maintain information in computerized form as long as possible.

CELS was developed to meet an unacknowledged need at Creighton. It is one way in which the Health Sciences Library is using technology to make its services more accessible today and in the future.

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COMPENSATING FOR THE LIMITATIONS OF SUBJECT INDEXING IN BIBLIOGRAPHIC DATABASES

by
Richard Jizba
Creighton University
Health Sciences Library

Modern technology has dramatically improved information retrieval systems. It is beyond question that online catalogs and CD-ROM indexes are more powerful and versatile than their print counterparts. Yet the effectiveness of these systems still depends on human factors. One of these factors is the limitation of subject indexing. The findings of inter-indexer consistency studies are used to illustrate the problems of subject indexing. After the problems are identified strategies which compensate for these limitations are given.

INTRODUCTION

Indexing requires decision making. How an indexer assigns terms to a document depends, in part, upon his training, experience, knowledge of the subject, and his perception of what the document is about. There may be many terms in a controlled vocabulary which could be used to index a particular document. Deciding which terms to use and which to reject is the choice of the indexer. Would different indexers make exactly the same choices when indexing a document? If it is unlikely that indexers would always agree on how to index a document, how confident should a searcher be his ability to select indexing vocabulary for a search? A good searcher needs to understand the problem of indexing consistency and how to address it.

PREVIOUS STUDIES

There have been many studies of inter-indexer indexing consistency published since the mid 1940s. Markey (1984) lists twenty-five and several more have been published since her review. Five papers published in the last ten years are of particular interest because they studied operational systems. Two of the five recent studies examined the indexing on duplicate records in the MEDLINE database (Funk & Reid 1983, Booth 1990). The third examined the indexing on duplicate records in Information Science Abstracts (Sievert & Andrews 1991). The fourth (Middleton 1985) examined indexing consistency for documents indexed in both the Australian Education Index and the ERIC database. The fifth study (Chan 1989) examined the assignment of subject headings to 100 pairs (LC and non-LC) of records from the OCLC database.

What have all these studies revealed about inter-indexer consistency? Unfortunately they show that high levels of consistency are uncommon. Markey (1984) found consistency scores for indexing based on controlled vocabularies ranged from 34% to 80%. The more recent studies cited above report consistency scores in the same range.

In her study, Chan (1989) found the average number subject headings assigned to a record was 1.90 for the non-LC records and 2.14 for the OCLC records. For both groups of records the range of headings assigned was zero to five with about 80% of the records in each group receiving one, two, or three headings. Only 15 of the 100 pairs of records she examined had perfectly matched subject headings. However, 6 of these 15 pairs were classed as matches because they were not assigned any subject headings. Of the remaing 85 pairs, five had no matching headings. Fifty five of the eighty five pairs of imperfectly matched records had one or more headings that matched perfectly. Of the headings that matched imperfectly, Chan found the main headings usually agreed and the inconsistencies usually occurred in the subdivisions.

Sievert and Andrews studied 80 pairs of duplicate records from the Information Science Abstracts (ISA) Database. ISA records are assigned one main heading which describes the overall content of the document being indexed. To this main heading the indexer may attach one or two subheadings. In addition the indexer assigns several "identifiers" to the record which are more specific than the main heading. Sievert and Andrews found that indexers added from two to four identifiers to a record. When the main headings were compared without consideration of the attached subheadings, 38 (54%) of the records had identical main headings and 33 (46%) did not. If the subheadings were included so that a the headings from a pair of records matched only if their main headings and attached subheadings matched, the consistency score fell to 34%. The consistency score for identifiers was 33%.

In their 1983 paper Funk and Reid examined 760 twice indexed articles from the MEDLINE database. These articles were identified by scanning several years of the author index from Index Medicus. The records from these papers were then retrieved from the MEDLINE database and the indexing was evaluated. Because MEDLINE indexing is done in-depth and includes several interesting features, Funk and Reid reported nine categories of consistency.

Several features of MEDLINE indexing are worth noting because they require the indexer to make several decisions for each term assigned. The vocabulary used to index records for the MEDLINE database is the Medical Subject Headings (MeSH). MEDLINE indexing is very thorough and an indexer may assign as many as twenty headings to a lengthy article. On average, MEDLINE records are assigned around ten headings.

When they assign headings to a record, MEDLINE indexers indicate if the heading represents a central or major concept in the paper or a peripheral or minor concept. Usually somewhat less than half the headings are designated as central concepts.

A MeSH heading may also be qualified with one of over 75 subheadings. The subheadings are used to provide a more specific description of the topic. For example, an indexer may assign the headings "*Ibuprofen - pharmacokinetics" and "Ibuprofen - administration & dosage" to a paper on the gastrointestinal absorption of ibuprofen from tablets. In both cases the MeSH heading is "Ibuprofen". The first heading is qualifed with the subheading "pharmacokinetics" and the second heading is qualified with the subheading "administration & dosage". The asterisk on the first heading indicates the indexer felt it represented one of the central concepts or topics of the paper. An example of a MEDLINE record is given in figure 1.

When Funk and Reid examined only the central concept headings without regard for the subheadings they calculated consistency of only 61%. This implies that almost 40% of the time the indexers did not agree on what constituted the main focus of the paper. When the subheadings were considered -- a pair of headings matched only if both the main heading and subheadings

FIGURE 1: A MEDLINE record showing the indexing.
(some portions of the record have been omitted)

```
90251536
  The   effect  of  food  on  gastrointestinal  (GI)  transit  of
sustained-release  ibuprofen  tablets  as  evaluated  by  gamma
scintigraphy.
  Borin MT; Khare S; Beihn RM; Jay M
  Pharm Res   Mar 1990,  7 (3) p304-7,  ISSN 0724-8741

  Languages: ENGLISH
  Document type: JOURNAL ARTICLE
  Subfile:   INDEX MEDICUS

  The  GI  transit  of  radiolabeled  sustained-release ibuprofen
800-mg  tablets  in  eight  healthy, fed volunteers was monitored
using external gamma scintigraphy. Ibuprofen serum concentrations
were  determined  from  blood  ...

                         **** INDEXING ****

 Check Tags (MeSH):
               Human
               Male

 Descriptors (MeSH) Major/Central Concepts:

               *Food
               *Ibuprofen - Pharmacokinetics

 Descriptors (MeSH) Minor/Peripheral Concepts:

                Adult
                Biological Availability
                Cecum - Radionuclide Imaging
                Delayed Action Preparations
                Erbium
                Gastrointestinal System - Radionuclide Imaging
                Gastrointestinal Transit
                Ibuprofen - Administration and Dosage
                Radioisotopes - Diagnostic Use
                Stomach - Radionuclide Imaging
                Tablets
```

Notes:

If a subheading is assigned to a heading it follows the dash.

Descriptor is a general term for a word or phrase from a controlled vocabulary assigned to a document by an indexer.

Check Tags are Medical Subject Headings which receive special emphasis and are to be assigned whenever they apply. They are never assigned as central/major concepts.

matched -- the consistency score fell to 43%. For non-central concept main headings the consistency score was 48% and fell to 34% when subheadings were included.

In 1990 Booth published his findings on indexing consistency for 28 pairs of duplicates from MEDLINE. Seven of the 28 pairs he studied (25%) had inconsistencies in their central concept terms. When only the minor descriptors were studied he found that nearly half the documents had more unique descriptors than common descriptors.

The lowest consistency score reported in a recent study is 22% (Middleton & Di'Orio, 1985). This was the average consistency score for indexing of common documents between the Australian Education Index and ERIC databases. While both services used the ERIC Thesaurus for indexing they did not assign the same number of terms to their records. The ERIC records were assigned an average of 9.3 descriptors while the average for the AEI records was only 5.7.

FORMULAS FOR CALCULATING CONSISTENCY

While all of these studies quantified the level of consistency they found, they did not use the same formulas to derive their consistency scores. Thus comparing the findings of different studies is difficult. Rolling (1981) discusses the validity of various formulas for measuring indexing consistency.

The formula used by Funk and Reid (1983) was:

$$\% \text{ consistency} = \frac{C}{C + Ua + Ub} \times 100$$

Where C is the number of terms used in common, Ua is the number of terms unique to indexer A, and Ub is the number of terms unique to indexer B. The formula used by Middleton and Di'Orio (1985) was:

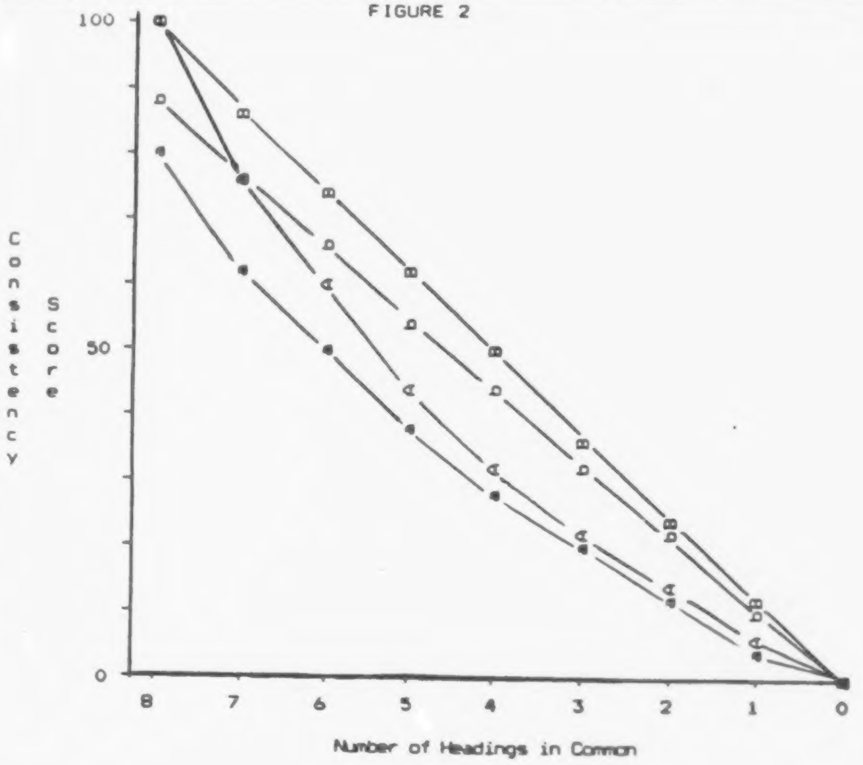
$$\% \text{ consistency} = \frac{2C}{Ta + Tb} \times 100$$

Where C is the number of terms used in common, Ta is the total number of terms used by indexer A, and Tb is the total number of terms used by Indexer B.

These two formulas produce different scores unless the indexing matches exactly or doesn't match at all. Examination of figure 2 shows that the formula used by Funk and Reid is effected to a greater extent by inconsistent terms. It should also be noted that discrepancies in the number of terms used by each indexer will also affect the scores.

For example, assume one indexer uses 8 descriptors to index a document while another indexer uses the same 8 descriptors but then assigns 2 additional descriptors to the same document. In this case the indexers have agreed on the content of the document but not how much

FIGURE 2



KEY:

A = Formula (A), both indexers assigned 8 terms.
a = Formula (A), one indexer assigned 8 terms, the other assigned 10.

B = Formula (B), both indexers assigned 8 terms.
b = Formula (B), one indexer assigned 8 terms, the other assigned 10.

<Funk & Reid used Formuala (A), Middleton & Di'Orio used Formula (B)>

$$\text{Formula (A)} = \frac{C}{C + Ua + Ub} \times 100$$

$$\text{Formula (B)} = \frac{2C}{Ta + Tb} \times 100$$

C = number of terms used in common.
Ua = number of terms unique to indexer A.
Ub = number of terms unique to indexer B.
Ta = total number of terms used by indexer A.
Tb = total number of terms used by Indexer B.

of the content should be indexed. The best consistency score they can achieve is either 80%, using the first formula, or 89%, using the second. This effect of discrepancies in the number of terms assigned on the consistency scores is shown by the plots of 'a' and 'b' in figure 2. The low scores reported by Middleton and Di'Orio (1985) are partly due to the difference in the average number of terms used by ERIC and AEI indexers.

PROBLEM

Assuming that some level of indexing inconsistency occurs in all bibliographic databases, how can the searcher minimize its effect on retrieval? The answer depends on the nature of the inconsistencies. If the inconsistency occurs because the indexers disagreed on the content of the paper then the searcher may not be able to compensate by modifying his use of the controlled vocabullary. However, the searcher may be able to develop strategies to account for the types of problems that occur when indexers agree on the content of a paper and but use different terms to describe it.

Unfortunately, authors of indexing consistency studies seldom describe the nature of the inconsistencies they discovered. Of the recent studies discussed above, only Booth (1990) provides examples of the types of inconsistencies he found.

METHODS

Sixteen pairs of duplicate records entered into the MEDLINE database in 1991 were discovered by chance. The records were printed and the indexing analyzed. Omitted from consideration were the check tags and the non-MeSH chemical terms assigned to each record. The indexing was analyzed four ways:

1. Consistency of descriptors (MeSH) disregarding attached subheadings and major/minor designation. For example, if indexer 1 assigned "*Pain - etiology" to a paper while indexer 2 assigned "Pain - prevention & control" to the same paper, these descriptors would be considered identical since only the main heading "Pain" is considered. (Descriptors occurring two or more times in a record are counted once. For example, in the record in figure 1, the descriptor ibuprofen is counted once even though it occurs twice because it is assigned two subheadings.)
2. Consistency of complete descriptors disregarding major/minor designations. For example, "*Pain - etiology" (major) is identical to "Pain - etiology" (minor) but is not identical to "*Pain - diagnosis".
3. Consistency of major and minor descriptors disregardings subheadings. For example, if indexer 1 assigns "*Pain - etiology" and indexer 2 assigns "*Pain - physiopatholgy" the headings are indentical becuase the main headings are both identical and designated major.
4. Consistency of full descriptors including major and minor designations.

In addition to scoring the pairs for consistency the nature of the inconsistencies will be discussed.

RESULTS

The average number of headings assigned to a record -- excluding check tags -- was 9.7. The range was 5 to 20 and the median was 9.5.

The consistency scores for the 16 pairs ranged from 0 to 100 in all four categories (Figure 3). The addition of subheadings or the major/minor designation reduces consistency and the effects are additive.

DISCUSSION

Although 16 pairs of records discovered by chance may not constitute a representative sample of all duplicates entered into MEDLINE in 1991, the consistency scores are consistent with those reported in other studies. For the searcher these findings illustrate the dangers of applying subheadings or using major descriptors in a search. If a searcher represents each concept in his search with a single descriptor and does not consider alternatives he may lose a substantial number of relevant records. An examination of several pairs of duplicate records (figures 4 - 8) sheds some light on the nature of the inconsistencies and indicates strategies a searcher might use to overcome them.

The only cause of inconsistency which can not be overcome is a disagreement between indexers on the content of a document. This problem occurs in Pair 6

FIGURE 3

Consistency scores for sixteen pairs of duplicate records from the 1991 MEDLINE database. Scores are given first for the descriptors (MeSH) alone without subheadings or major/minor designations. Then the result of adding subheadings is shown, followed by the result of adding the major/central concept designation, and finally the result of adding both.

Pair	Descriptor		Descriptor with qualif.		Major Descriptor		Major Desript. with qualif.	
	(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)
1	62	77	18	31	0	0	0	0
2	45	62	22	36	0	0	0	0
3	11	20	11	20	0	0	0	0
4	100	100	100	100	100	100	100	100
5	47	64	31	47	25	40	10	18
6	64	78	57	73	50	67	25	40
7	75	86	75	86	80	89	80	89
8	71	83	47	64	60	75	14	25
9	64	78	60	75	28	44	12	22
10	100	100	100	100	100	100	100	100
11	30	46	25	40	17	28	0	0
12	62	77	36	53	50	67	50	67
13	92	96	77	87	40	57	17	28
14	56	71	50	67	25	40	20	33
15	82	90	54	70	57	73	38	54
16	0	0	0	0	0	0	0	0
mean:	60	70	48	59	40	49	29	36

$$\text{Formula (A)} = \frac{C}{C + Ua + Ub} \times 100$$

$$\text{Formula (B)} = \frac{2C}{Ta + Tb} \times 100$$

C = number of terms used in common.
Ua = number of terms unique to indexer A.
Ub = number of terms unique to indexer B.
Ta = total number of terms used by indexer A.
Tb = total number of terms used by Indexer B.

(figure 7) when one indexer identified "Movement" as a major concept discussed in the paper and the other indexer did not assign the heading. This type of inconsistency also occurs in pair 1 (fig 4) where one indexer included "Autonomic Nervous System" as a major heading when the other indexer did not use the heading at all.

The most common cause of inconsistency seems to be indexers' use of different but closely related terms. Usually these terms are near synonyms or are hierarchically related.

Pair 11 (figure 8) provides examples of inconsistencies resulting from the indexers using different but fairly synonymous headings. The examples are: Posture vs. Supination (both major) and Centrifugation v. Rotation (both minor).

Pair 2 (fig 5) illustrates inconsistencies resulting from one indexer choosing a general rather than specific term for a subject. In pair 2, one indexer used the general heading "Peripheral Nerve Diseases". The other indexer used "Cranial Nerve Diseases" which is defined as a subcategory of peripheral nerve disease in MeSH. In pair 1 (fig 4) both indexers included the heading "Personality Inventory", but the indexer of the first record also included the heading "Psychometrics".

FIGURE 4

```
PAIR 1:

91195452
Autonomic reactivity and personality.
Lester D; Ecker C; Kimchick M
Psychol Rep  (UNITED STATES)  Dec 1990  67 (3 Pt 2) p1314

Tags: Female; Human; Male

Descriptors: *Arousal
             *Personality Inventory
              Adult
              Neurotic Disorders - Psychology
              Psychometrics
              Psychotic Disorders - Psychology


91195449
Autonomic reactivity and personality.
Lester D; Ecker C; Kimchick M
Psychol Rep  (UNITED STATES)  Dec 1990  67 (3 Pt 2) p1304

Tags: Female; Human; Male

Descriptors: *Autonomic Nervous System - Physiology
             *Personality
              Adult
              Arousal - Physiology
              Neurotic Disorders - Diagnosis
              Personality Inventory
              Psychotic Disorders - Diagnosis
```

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FIGURE 5

PAIR 2:

A case of left hypoglossal neurapraxia following G exposure in a centrifuge.
Katchen MS; Lyons TJ; Gillingham KK; Schlegel W
Aviat Space Environ Med Sep 1990, 61 (9 Pt 1) p837-9,

Tags: Case Report; Human; Male

Descriptors: *Pain - Diagnosis
*Peripheral Nerve Diseases - Diagnosis
Adult
Centrifugation
Gravitation
Hypoglossal Nerve
Neck
Pain - Epidemiology
Pain - Etiology
Peripheral Nerve Diseases - Complications
Peripheral Nerve Diseases - Epidemiology
Prevalence

A case of left hypoglossal neurapraxia following G exposure in a centrifuge.
Katchen MS; Lyons TJ; Gillingham KK; Schlegel W
Aviat Space Environ Med Sep 1990, 61 (9) p837-9,

Tags: Case Report; Human; Male

Descriptors: *Gravitation
*Hypoglossal Nerve - Injuries
Adult
Cranial Nerve Diseases - Diagnosis
Cranial Nerve Diseases - Etiology
Neck - Injuries
Neural Conduction
Pain - Diagnosis
Pain - Etiology
Rotation - Adverse Effects

FIGURE 6

```
PAIR 3:
A new approach to the analysis of nystagmus: an application for
order-statistic filters.
Engelken EJ; Stevens KW
Aviat Space Environ Med Sep 1990, 61 (9 Pt 1) p859-64,

Tags: Human

Descriptors:  *Diagnosis, Computer-Assisted - Methods
              *Nystagmus - Diagnosis
               Electrooculography
               Filtration
               Software

A new approach to the analysis of nystagmus: an application for
order-statistic filters.
Engelken EJ; Stevens KW
Aviat Space Environ Med Sep 1990, 61 (9) p859-64,

Tags: Human

Descriptors:  *Nystagmus, Physiologic - Physiology
              *Software
               Aerospace Medicine
               Equipment Design
               Rotation
```

FIGURE 7

PAIR 6:

Changes in geometrical and biomechanical properties of immature male and female rat tibia.
Zernicke RF; Hou JC; Vailas AC; Nishimoto M; Patel S; Shaw SR
Aviat Space Environ Med Sep 1990, 61 (9 Pt 1) p814-20,

Tags: Animal; Female; Male; Support, Non-U.S. Gov't; Support, U.S. Gov't, Non-P.H.S.; Support, U.S. Gov't, P.H.S.

Descriptors: *Bone Development - Physiology
*Movement - Physiology
*Tibia - Physiology
Age Factors
Albinism
Biomechanics
Rats
Rats, Inbred Strains
Sex Factors
Tibia - Anatomy and Histology
Tibia - Growth and Development

Changes in geometrical and biomechanical properties of immature male and female rat tibia.
Zernicke RF; Hou JC; Vailas AC; Nishimoto M; Patel S; Shaw SR
Aviat Space Environ Med Sep 1990, 61 (9) p814-20,

Tags: Animal; Female; Male; Support, Non-U.S. Gov't; Support, U.S. Gov't, Non-P.H.S.; Support, U.S. Gov't, P.H.S.

Descriptors: *Bone Development - Physiology
*Rats, Inbred Strains - Growth and Development
*Tibia - Growth and Development
Age Factors
Biomechanics
Body Mass Index
Models, Biological
Rats
Sex Factors
Tibia - Anatomy and Histology
Tibia - Physiology

FIGURE 8

```
PAIR 11:

Partial supination versus Gz protection.
Wood EH; Code CF; Baldes EJ
Aviat Space Environ Med Sep 1990, 61 (9 Pt 1) p850-8,

Tags: Human; Male; Support, U.S. Gov't, Non-P.H.S.

Descriptors:  *Acceleration - Adverse Effects
              *Posture - Physiology
              *Unconsciousness - Prevention and Control
              *Vision Disorders - Prevention and Control
               Adult
               Centrifugation
               Gravitation
               Unconsciousness - Physiopathology
               Vision Disorders - Physiopathology

Partial supination versus Gz protection.
Wood EH; Code CF; Baldes EJ
Aviat Space Environ Med Sep 1990, 61 (9) p850-8,

Tags: Human; Support, U.S. Gov't, Non-P.H.S.

Descriptors:  *Gravitation
              *Supination - Physiology
              *Unconsciousness - Physiopathology
               Adult
               Rotation
               Visual Acuity - Physiology
```

Since MeSH considers Personality Inventory to be a type of Psychometric the first indexer simply included a specific and a general term for the same concept.

What appears to be another case of general vs. specific headings occurs in pair 3 (fig. 6). One paper is indexed under "Nystagmus" and the other under "Nystagmus, physiologic". The indexing annotation in the 1991 MeSH states for Nystagmus: "A disease; do not confuse with Nystagmus, Physiologic". A similar annotation is given under "Nystagmus, Physiologic". While the creators of MeSH (the National Library of Medicine) may not consider these to be closely related headings, this example shows unmatched headings may contain common words.

Since most computerized search systems for bibliographic database index each word in a descriptor, the occurrence of identical words in diffent descriptors may provide the searcher with another solution to indexing inconsistencies. The following heading pairs do not match but do contain common words: "*Personality" and "*Personality Inventory" (fig. 4), "Peripheral Nerve Diseases" and "Cranial Nerve Diseases" (fig. 5).

To compensate for indexing inconsistencies the searcher may want to consider the following heuristics:

1. Don't restrict both terms in an "AND" operation to major. Consider:

   (Ibuprofen/maj and Pain) or (Ibuprofen and Pain/maj)

   in place of:

   Ibuprofen/maj and Pain/maj

2. Don't put a major designation and a qualifier or subheading on the same term. Consider:

   Pain/maj and Pain-etiology

   in place of:

   Pain-etiology/maj.

3. Use both general and specific headings.
4. Use closely related headings.
5. Search by words, not full descriptors.
6. Consider alternate ways to index your search topic:

   Anesthetics-adverse effects or
   Anesthetics-toxicity

   Liver diseases-chemically induced or
   Liver-drug effects.

7. Don't rely solely on the indexing, always consider searching the title and abstract terms if possible.

CONCLUSION

The problems inherent in subject indexing are illustrated by studies of indexing consistency. Since indexing is imperfect it is the searcher's responsibility to understand the limitations of indexing systems and adapt his search techniques accordingly.

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COMMON COMMAND LANGUAGE

Donna J. Jurena

Perkins Library

Doane College

Crete, Nebraska

ABSTRACT

With the proliferation of online information retrieval systems, OPACS, and CD-ROM products, confusion occurs about the command language and symbols to be used during a search. To be able to access information, librarians and users must learn a variety of commands and symbols for each system. This paper will discuss the efforts by NISO to create a common command language to be made available to all online information retrieval systems and the reasons such a language is needed in all areas of computerized information retrieval.

Imagine: you're a reference librarian with access to Dialog, BRS, ORBIT, EPIC and Wilsonline. Which command will you use to end your search session? Stop, end, quit, exit, logoff, off, bye, or logout?

Imagine: you're a student at a nearby college. Your school's library provides access to FirstSearch and has an automated catalog. You also like to use the public library which has several Wilson indexes on CD-ROM. How many search terms must you learn to use these systems effectively?

In recent years, computerized access to information has grown to enormous proportions. Utilities such as DIALOG and BRS provide access to hundreds of databases. EPIC made it possible to search the huge OCLC database by subject. EASYNET gave us a menu mode to search several utilities and Wilson made its indexes available online and on CD-ROM. Unfortunately, a user of any of these systems must learn different command languages for the same functions before accessing the data. This includes, but is not limited to, distinguishing between the search statements, truncation symbols, boolean operators, and nesting properties. It seems apparent that some sort of common command language should be developed to enhance the use of these databases. NISO (National Information Standards Organization), a committee of ANSI (American National Standards Institute) has done this.

Establishing a new standard is a time consuming affair. A committee is selected which includes all parties that will be affected by the standard. Every effort is made to consider all sides of an issue, a position is then stated and sent to all voting members who may accept it or propose changes to it. The proposal is then sent back to the committee where it can be revised.

Committee G was formed by NISO in 1985 to develop a command language that could be used by all utilities. The committee consisted of vendors, database designers, consultants, system designers (Klemperer 1987:20) and trainers of online systems. (Morrison 1989:46) Its purpose was to design a proposal to provide users with a core vocabulary which could be used to search "...all online interactive information retrieval systems which use a command language for user-system interaction, irrespective of the nature of the data or databases involved (e.g., bibliographic, textual, numeric, chemical, etc.)." (NISO Standards 1987:2) It was hoped that a common command language would reduce the "...existing diversity in the command languages presently in use." (Morrison 1989:46) This standard applies to all bibliographic retrieval systems from online databases, including automated catalogs, to CD-ROM products, but does not apply to software items such as spread sheets or word processing packages.

The standard consists of twenty commands, (Appendix A), "...rules of syntax for governing the structure of the command, abbreviations of commands, components and format of commands, and the use of separators, such as spaces, commas and semicolons." (Levy 1987:31) Since the language was designed with the user in mind, a "terse but English-like syntax and vocabulary were chosen, with a verb-oriented structure." (Klemperer 1987:8) It is precise and unambiguous and may have the side benefit of being easily translated into Western European languages. According to Morrison (p.47), the proposal was guided by four principles:

1. the language would serve the needs of new and/or infrequent users
2. the command structures would be flexible, but as consistent and predictable as possible
3. details specific to the implementation would be left to the system designers
4. special characters and punctuation would be held to a minimum.

This standard is not meant to impose limits on the versatility of the different utilities, nor does it represent a "...minimal, a basic, or an exhaustive set of functions." (NISO Standards 1987:2) Systems can use other modes of user-system interaction such as menus or non-standard languages along with the standard language. The system would respond to both the native language and the standard language. A problem only arises when the meaning of a native language command conflicts with the meaning of a standard command. In this case, the function of the standard command must be performed. (NISO Standards 1987:2)

Implementation of this standard is possible on a variety of levels. For example, a system designer could use those parts of the language that already exist in the current system, but use other commands. The system would perform the function HUNT when the command FIND is typed, for example. If a command is not used, the system simply displays a message to the user stating that the particular command is not available.

Another system may choose to implement the system as stated above, but would also incorporate those commands which are not currently used and that do not cause ambiguity. As in the above approach, this would require the system to make some translations, but it would also add some new functions. Both of these approaches can lead to problems when a command term in the native language yields a different response from the same term in the standard language. The system would have to explain the ambiguity to the user each time, frustrating the user who is familiar with the native language. He/she would have to override the message each time. (Morrison 1989:51)

A system designer could choose to "implement all unambiguous, compatible features, add nonexisting features, and change existing conflicting operations to conform to the common command language." (Morrison 1989:51) This would eliminate the problem of choosing which function a command would perform for the user, but would represent a considerable investment for the designer and for retraining of experienced users. One way to avoid this would be to give users a choice of languages.

Full implementation involves accepting the whole standard as written, ignoring the original, native language. New systems, especially those in development, may find this the easiest and best option. (Morrison 1989:51)

The benefits to implementing a standard language are many. Clearly, the user of multiple systems would benefit. Even though some of these users are fluent in several languages, it can be frustrating when one service provides a simple command for a function that is made difficult on another system. (Basch 1990:18) Learning only one language, enabling the searcher to perform all functions in a variety of information sources, would be ideal. Talking to a reference librarian at the Nebraska Library Commission, I learned that she must know five different command languages to perform her job. She would welcome a standard that would allow her to search all the databases using the same commands.

Library users would also benefit from a standard language. In the past, the knowledge learned in one library could be transferred to other libraries. If you learned how to search a card catalog or use an index to periodical literature at Doane, you could take that knowledge to Love Library and find added information on your topic. Now, with automated catalogs and indexes on CD-ROM, the user must learn how to use each system independently. Valuable time that could be used searching is now used to learn multiple systems. The casual learner is not interested in processes, but in finding the needed information quickly. If a standard language were employed, the user could learn how to search in his home library and would then be able to transfer that knowledge to other libraries.

Another group to benefit from a standard language would be the teachers of information retrieval skills. Currently, at Doane, a course is offered to introduce students to the computerized search tools available in the library. The course was designed to teach the students how to manipulate the computers and how to form effective search statements. Unfortunately, more time is spent teaching students how to access different databases and the commands used in those databases than on thinking critically and forming good search statements. Clearly, teachers and students alike would benefit from a standard language for all utilities, putting the emphasis on intellectual content rather than on the technical aspects.

Others who benefit would be system designers. Since there would be a command language in place, the designer would be freer to work on those matters that make information retrieval more accessible, such as search term selection, and indexing. Screen displays could be uniquely designed to enhance a patron's use of a system. (Morrison 1989:49)

Linked systems could be searched with ease if a common command language were used. Within an institution, a network could be installed to include all CD-ROM products such as the Wilson indexes, Books in Print, and Autographics. Users knowing the standard language could search any of these products, as well as any available online databases. In shared systems with other libraries, a standard language would provide a common meeting ground for communication between computers. Users would be able to access systems in other libraries using a familiar command structure.

The assumption cannot be made that a standard language will solve all of the problems associated with searching different utilities. There will still be differences in the prompts, displays, and indexing. Indexing is particularly important as it affects the search strategy used when approaching a particular database and can affect the results obtained.

Where are we now? Some American bibliographic retrieval systems have implemented some of the standards, while others are waiting to see what happens with international standards and what the customers are demanding. Currently, DIALOG does not conform to the standard language, but EPIC does. "Wilsonline searchers may have the easiest time taking advantage of the NISO .... common command language since that system offers the capability of renaming commands at the beginning of an online session." (Garman 1989:49)

To circumvent the command language problem, some utilities (i.e. EasyNet, Dialog, and Wilsonline) offer menu driven searches. While this may be a possible solution for the casual searcher, I do not find it viable as an experienced searcher. Menus are time consuming to use and, therefore, can be more expensive. They do not allow the sophistication that some searches require. In some cases menu driven searches do not provide access to all of the indexes available on a particular database. For example, when searching Wilson indexes, you would get different responses using Wilsearch (the menu driven search mode) and Wilsonline (the expert or command mode) because all portions of the index are not searched in Wilsearch. Truncation and boolean searching are not always available in menu modes. Menus may be an option for a quick, easy search, but not for most college students doing in-depth research.

"Currently the only way to access online systems using the Common Command Language is through gateway services such as EasyNet." (Nickerson 1991:44) There have been programs developed, such as Slashbar, which can be loaded and used locally as interfaces so that patrons can use one language to access several utilities. While these are helpful locally, they do not solve the problem of linked systems or transferability of knowledge from library to library.

Although the standard language has not been adopted by many database providers yet, there is hope. Evidence indicates that vendors are listening to the suggestions of their customers. For example, DIALOG recently made duplicate-killing a reality, an enhancement for which customers had been asking. They also included a suggestion box at one of their recent exhibits. (Basch 1990:22) Gaylord had developed an integrated system which allows for networking CD-ROM products and OPACs. (Flanders 1991:853) This system does use the NISO standard communication protocols.

As librarians, we know the needs of information seeking patrons. We see the confusion the different automated reference tools can create. We know, first-hand, the difficulty of remembering several different command languages. "...Vendors seem to understand better than ever that compliance with the array of industry standards...is not only desirable, but absolutely essential to their survival in a highly competitive marketplace." We need to talk to vendors, express our concerns and needs and then support those who listen.

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APPENDIX

COMMON COMMAND LANGUAGE

EXPLAIN--used to obtain information about the system, its use and its databases

HELP--to obtain online assistance

START--initiates a session

STOP--terminates a session

CHOOSE--to select file(s) or database(s) to be searched

FIND--to enter a search statement

Qualifying search terms--directs search to specific index. Character masking symbols (truncation) are the ? for zero to infinity and the # to stand for one character. Boolean operators 'and', 'or' and ,not' are used as are the proximity operators 'N' and 'W'. Limiting and ranging operators are 'GT' (greater than), 'LT' (less than), 'GE' (greater than or equal to), and 'LE' (less than or equal to). The recommended order of precedence for the execution of these commands is character masking operators, proximity operators and boolean operators 'or' 'and' 'not'.

SCAN--to view an ordered list of search terms

RELATE--to view terms logically related to search term

DISPLAY--to view online at user's terminal the results of searches

PRINT--to request offline printing

SORT--to arrange records in search results sets by specified field(s)

FORWARD--to view continuing data or data following displayed data or items on a list

BACK--to view data preceding displayed data or items on a list

REVIEW--to view a search history

SAVE--to save searches or search strategies for later use

KEEP--to identify and save within a session one or more sets of search results or particular records from previous search results

DELETE--to delete search strategies, search sets, search results, defined commands or print requests

SHOW--to view session parameter default values

SET--to set or override default parameter values for a session

DEFINE--to create user macros (a sequence or package of commands to perform a multi-step process), to rename a single command word, or to name a command expression with a single word

Taken from the NISO Standards for Libraries/Information Sciences/Publishing Proposal for Common Command Language for Online Interactive Information Retrieval. Z39.58-198x July, 1987.

EVALUATION OF ONLINE CATALOGS ACCESSIBLE THROUGH INTERNET

Frank H. Sun

Love Library
University of Nebraska-Lincoln

Lincoln, Nebraska

ABSTRACT

Today's global economy requires university faculty and students to develop a worldwide perspective on their teaching, study and research. Internet, a high speed international electronic network of information networks, provides its participants with free access to hundreds of online library catalogs in colleges, universities and research organizations around the world. Librarians need to assume a leadership role in helping end-users to retrieve this valuable information in these catalogs. One approach towards this goal is to incorporate selective Internet access into the local online system. This paper will focus on the evaluation criteria and the process involved in such a selection.

Higher education plays an increasingly important role in the development of a world view. Education must prepare the citizenry of the world to use the information infrastructure essential to growth and development as well as to world understanding. Information technology and linked capabilities in colleges and universities are growing quickly throughout the United States and other countries. Internet, a group of nearly 2,000 networks at university and research centers, provides access to computing and information resources in North America, Latin America, Europe, and Pacific Rim. These networks support electronic mail, file transfer, remote log-in, and software archives. Estimates of host computers on the Internet range from 40,000 to 500,000 and users mumber probably somewhere between 500,000 and a million.[1]

Networks participating in the Internet are able to establish communication links because each uses the industry standard TCP/IP networking protocols.[2] Information resources such as library catalogs are accessed across the Internet by using a TELNET command which allows log-in to a remote host for the purpose of using a service without telephone charge. Academic libraries offer services over the Internet which include online public access catalogs, other local databases such as newsletters, public domain software, and similar information.

At the University of Nebraska-Lincoln (UNL), a decision was made by the library administration to provide library users with Internet online catalog access through the local automated system. In October, 1991, an ad hoc committee named OPAC was set up to evaluate and select relevant online catalogs on Internet for local access.

WHY THE LIBRARY PROVIDES ACCESS

The value of searching catalogs through Internet lies in the "intellectual access" gained to an expanded universe of sources beyond those available at a local institution. It also allows users to maximize their time by searching a remote location before leaving the campus. Searching the local catalog, as opposed to a utility such as OCLC, also saves time by combining the steps of identification and location.

Theoretically, if the campus is connected to the Internet, anyone on campus can get an account on a computer which has Internet access. That means anyone in the university may have access to hundreds of online catalogs around the world free of charge through a terminal or work station at the university computer sites, or by dialing into this account using a personal computer with a modem. In reality, many elements may prevent an individual from accessing Internet or using it efficiently if a library does not provide that service. First, the general public may not be aware that those accesses are readily available and free of charge;

second, users may find it difficult to understand the conflicting protocols and commands which must be utilized in remote log in. These difficulties can be compounded by the lack of print or online documentation of log-on and log-off procedures; finally, some remote system access may require communication interface or emulation which users may not have on their searching terminals or work stations.

With the library's Internet access system, patrons are provided with a single source, a common interface, and a unified environment from which to retrieve information. The system may create scripts which will log a patron all the way into the chosen catalogs. Users can make their choice from the system menu which lists catalogs selected by the library based on the merit of their collections and their technical strengths. Once a choice is made, the computer program will do the remote log in automatically.

EVALUATION CRITERIA

Although there are hundreds of online catalogs listed in Internet--Accessible Library Catalogs & Databases, a local system may not want to have them all available. In addition to economic concerns such as programming and computer storage space, there is the

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worry that users may be overwhelmed with choices and frustrated by the fact that some online catalogs are difficult to access because of technical problems such as response time, communication protocols and terminal incompatibilities. A set of criteria, therefore, was developed at the UNL libraries to evaluate and select a number of suitable online catalogs.

Collection Consideration

The first group of criteria mainly concerns the collection of the target institution, namely: the uniqueness of the collection; nature of the collection, i.e. whether it is a local, state, or regional library; the unique features of the database; and the size of the database.

The "uniqueness of the collection" refers to the special features of a certain institution's research materials. An institution's special collections and collection development emphasis are checked against the American Library Directory and other reference tools. Another approach is to solicit recommendations from university and library faculty who are familiar with the collection of a certain institution.

The "nature of the collection" refers to institutions whose collections may have something in common with that of the UNL library because of their academic mission or geographic location. These are also the institutions with which UNL library has a close relationship in resource sharing such as document delivery or with which it expects to establish close ties in the near future. Examples are the Big Eight universities and the midwestern state library systems.

The "unique features" refer to those online systems which contain information beyond the concept of a traditional catalog. Additionally, the information falls into the public domain, i.e. access to the information requires no special password or sign-on. Examples of such online systems on Internet are: CARL, a consortium of Colorado based research institutions, offering online access to the contents of current journals; Carnegie Mellon University, offering "Arch-Pics" (an index to architectural illustrations); and Arizona State University, offering "Map Index" and "Solar Energy Index".[3]

The "size of database" concerns the quantity of records in machine-readable form. Collection strengths stated in reference tools do not necessarily reflect the reality of the online catalog. Many items, especially those in special collections or archives, may not have been converted into MARC format, and therefore are not included in the online catalog. For example, according to

The American Library Directory, Harvard University has a collection of over 8 million volumes, but its online catalog contains only 2 million records. Similar discrepancies exist in almost all online catalogs. Before selecting a catalog it is necessary to measure the gap between the size of the collection an institution owns and the size of its online catalog.

Technical Consideration

The second group of criteria is used to measure the performance of an online catalog under the condition of remote access. It concerns the technical consideration of user friendliness, response time, and search capabilities.

User Friendliness

A user friendly system, according to Meads,[4] has three distinctive characteristics: 1. the system is cooperative--it provides active assistance during the task and makes its actions clear and obvious; 2. the system is preventive--it acknowledges that people make mistakes by preventing as many mistakes as possible and by providing backup and recovery procedures; 3. the system is conductive--it is reliable, predictable, and assists rather than controls the user.

Active assistance includes, but is not limited to, the following: menu choice or command inquiry prompt;

help screen option; a self-explanatory bibliographic structure, such as a screen display of the format of the library catalog card or the information fields labeled with language free of library or computer jargon; consistent use of terminology and format which facilitates understanding of the information presented on screen; and easy to read screens on which the information is logically arranged.

System preventive and recovery procedures include the accommodation of users' inputs of punctuation, upper or lower case and spacing, and the forgiveness of errors in entry. This procedure always lets the user know what is being done and offers suggestions about what to do next. The system will not, at the touch of a finger, go off and perform some action that is totally incomprehensible to the user. It also does not allow the user to enter illegal commands.

A conductive system means that the user will feel in control of the system and not the other way around. The system will not tell the user that s/he has done something wrong, rather, it will let the results speak for themselves and will provide positive suggestions.

Most online catalogs we reviewed provide a helpful user interface. According to their function access, these catalogs can be roughly divided into three groups:

menu choice, (INNOVATIVE system, Melvyl, California Polytech) command line input (Ohio State, Notre Dame) and those somewhere in between (GEAC, NOTIS systems). The most user friendly function access of the three is menu choice. Search selection and manipulation are eased through menu selection. Menus are easy to learn and use and do not require the searcher to remember special commands. This is especially helpful for remote users who are usually untrained for a particular system and "approach the system with diverse perceptions, skills, knowledge, preferences, and motivations."[5]

The major drawback associated with the menu based systems is the length of time required to redraw the menus after each choice on a networked library system. This can often be very frustrating for experienced users.

Some systems such as Melvyl are really flexible in this area. They provide both command line input and menu choice to accommodate different levels of skill, though their menu interface is not as sophisticated as some other systems, such as INNOVATIVE.

When evaluating the online catalogs' user friendliness, we especially looked for features such as the ability to repeat a previous command and to scroll backward and forward in a long search without exiting from the search. Other useful features include the wraparound of text, a display with a manageable amount of data at any one time and, most important, an easy and obvious way for users to correct typographical errors.

Response Time

Response time may be defined as the average length of time between the sending of a command to the system by pressing a key on a terminal and the display of a prompting symbol or other indication that the system is ready to receive another command.[6]

Many factors, such as database size, terminal number, software components, and search methods will have an impact on response time on a local online system. For a remote access network like Internet, even more factors need to be considered since its access may not reach a target catalog until it passes across several networks and over a transmission path through a satellite. Among those elements, however, user traffic seems to have the greatest effect on response time. For instance, the response time of a search at peaks in the user cycle can be 10 to 15 times longer than that of a similar non-peak time search in the same system.

One of the advantages of Internet is that it includes online catalogs in different time zones. If carefully selected, users can always find a couple of catalogs with decent response time at any given time. In other words, we try to measure the response time of a catalog at its non-peak time and require its response to a single keyword search to be less than 3 seconds. Once the remote catalogs are accessible through the local system, a list of non-peak or peak times for using those catalogs may be prepared to help users choose an appropriate searching time.

Search Capabilities

The search capabilities of an online catalog should be equal to, and preferably greater than, those of a card catalog.[7] That means the online catalog, at a minimum, should be searchable by title, author, and subject. Added search capabilities such as call number, series, ISBN, or ISSN, are a plus. Research indicates that subject searching is the most popular and most frequently used search method among faculty and students.[8] However, it is also the method that poses the most problems. Users often have problems both with performing the subject search and with identifying the right subject terms. In several monitoring studies reviewed by Markey,[9] no-match subject searches ranged from a low of 35% on Melvyl to a high of 57% in the BACS system.

A system with keyword search capability will improve the situation.[10] Keyword searching is a powerful and more natural search method because it can search by component words in titles or subject headings. It also relieves the user from having to enter (or be guided to) the correct subject terminology as is required when searching by subject heading. Keyword access to title, corporate body and conference name also increases users' hit rate of specific item searches.

Today many catalogs on Internet provide some sort of keyword access to subject, title, and author, with systems developed by GEAC and INNOVATIVE at the low end (single keyword search) of the capability, and by NOTIS at the high end, providing users with a full range of Boolean and proximity search capabilities.

Other Considerations

"Database Quality" is another criterion used in the evaluation process. It is mainly concerned with the record quality and database structure of an online catalog. Since most, if not all, of the online catalogs consist primarily of MARC records which can be found in a national or an international bibliographic utility such as OCLC or RLIN, their records are generally considered to be of acceptable quality.

Database structure is a different story. Currently libraries around the world use at least 30 different brands of online catalogs, each with its own set of screen displays, commands, and record structure.[11]

Variation in the representation of data and differences in each catalog include: the availability of "indexes" for searching; type of searching (keyword, whole term, etc); Boolean and proximity operators; presence of stopwords; and special treatment in the indexing of initialisms, acronyms and abbreviations. There is also an enormous variation in the treatment of punctuation, diacritics, and special characters. Online catalog users of a single library system are not adversely affected by this non-standard practice (at least not until their library changes to a new brand), but users of Internet are, and they must learn how to work with a variety of database structures. This may cause frustration to users who have learned how to search successfully in a local catalog when they come across a different one. To minimize the effect of this problem, we try to select as many online catalogs developed by the same vendor as possible. Notably, we choose catalogs supported by INNOVATIVE (because the UNL libraries employ this system) and NOTIS.

EVALUATION PROCESS

The OPAC committee was composed of five people from public and technical services charged with formulating evaluation criteria and with selecting the online catalogs. The coordinator of the library automated system acted as a resource person and provided technical support. Each criterion was assigned a certain number of points for a total of 100. All of the online catalogs listed in the Internet--Accessible Library Catalogs and Databases, except for the international ones which will be on the agenda in the second phase of the project, were searched, reviewed, and rated by committee members on the basis of criteria listed in Appendix A. The systems with emulation and incompatibility problems were eliminated immediately. After two rounds of group review and discussion, a final list (Appendix B) of 19 online catalogs accessible through Internet was submitted to the library administration for consideration.

CONCLUSION

The University of Nebraska-Lincoln libraries have embarked on a project that should eventually bring many useful online catalogs from around the world into a single locally supported gateway system. As Culkin stated, "by reconceiving OPACs in modern telecommunication environments, we accomplish several objectives: 1. Expand the scope and volume of research material available to any user; 2. Create a loose but effective organization of these materials; 3. Simplify

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the medium; 4. Convey the structure; 5. Become an active participant in the educational process."[12]

For teaching institutions the Internet provides a means of communicating with a widely distributed population of students and faculty and allows access to resources that might otherwise not be possible. At the same time, the online catalog evaluation process helps to minimize the negative impact of the influx of a massive amount of information.

ACKNOWLEDGMENT

The evaluation and selection criteria developed and listed in Appendix A and the final recommendation of online catalogs listed in appendix B are the collective work of the OPAC committee. The chair of the committee, Dana Boden, made an especially noteworthy contribution. The opinions expressed in this article, however, are those of the author and may not necessarily reflect the views of the committee as a whole or of individual committee members.

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APPENDIX A

OPACS ON IRIS RATING SHEET

INSTITUTION: ______________________________

1. Uniqueness of collection(s) (20 pts possible) _______

2. Local, state, regional library (20 pts possible) _______

3. Unique features (15 pts possible) _______

4. User friendly/easy to use (15 pts possible) _______

5. Quick access/response time (10 pts possible) _______

6. Size of library's database (10 pts possible) _______

7. Quality of database (5 pts possible) _______

8. Keyword availability/search capabilities (5 pts.) _______

TOTAL (100 points possible) _______

Further notes or comments:

APPENDIX B

Top-rated Online Databases Recommended for Access via IRIS Plus

(Listed in Alphabetical order)

1. University of California -- MELVYL system for University of California Libraries and California State Library.
2. California Polytechnic State University.
3. Carnegie-Mellon University. (NOTIS system)
4. Case Western Reserve University.
5. Harvard University -- requested by faculty member.
6. University of Hawaii.
7. University of Illinois, Champaign/Urbane -- requested by faculty member.
8. University of Iowa. (NOTIS system)
9. Iowa State University -- Big 8 institution. (NOTIS system)
10. University of Kansas -- Big 8 institution.
11. University of Maine. (INNOVATIVE system)
12. University of Minnesota -- Requested by faculty.
13. University of Notre Dame.
14. University of Oregon. (INNOVATIVE system)
15. University Pennsylvania.
16. University of Pittsburgh. (NOTIS system)
17. Texas A & M University.
18. University of Texas at Austin -- Requested by faculty.
19. University of Wisconsin -- Requested by faculty.

A FULBRIGHT ?   FOR LIBRARIANS ?!?

Thomas A. Tollman

University Library
University of Nebraska at Omaha

Omaha, Nebraska

ABSTRACT

There are a number of avenues to explore in the quest for professional renewal and enrichment - for many, new assignments and different projects address these needs. In a number of academic libraries (and a few others, as well), periodic professional leaves are available on at least an occasional basis. This paper describes the experience of one university librarian as he went through the process of applying for a Fulbright grant. Major emphasis is placed on the range of opportunities within the Fulbright program itself, followed by a brief mention of the author's grant experiences working with librarians in Ecuador during 1991.

INTRODUCTION

In the past decade there has been a perceived, if not an actual, slowdown in the turnover of positions in many academic libraries. As people tend to stay longer in a single organization or position, the potential for stagnation or burnout increases.

There are a number of avenues to explore in the search for renewal and refreshment of both a professional and a personal nature. Depending on the size and structure of the library, there may be greater or lesser opportunities for new assignments within the same job or for promotion through the ranks into administrative positions. In other cases, job-sharing or job-trading arrangements may be possible within or between cooperating institutions. Much depends upon the imagination and resourcefulness of the individual librarian and the flexibility and tolerance of his or her supervisor. In many academic libraries, and a few other types of libraries as well, periodic professional leaves or sabbatical leaves may be possible.

Such leaves are often used to pursue coursework or to visit one or more other libraries to observe, write, or do various types of research. In many disciplines, faculty members undertake sponsored or independent foreign travel. Until three years ago, I had not really been aware of the number or range of foreign opportunities that were available to librarians. In my time with you this afternoon I would like to describe one such opportunity in some detail - the Fulbright program of lectureships and research grants - and touch briefly on another - the Library/Book Fellow program, jointly sponsored by ALA and the United States Information Agency.

THE FULBRIGHT PROGRAM

Perhaps the most famous of the academic international exchange programs had very humble beginnings. J. William Fulbright was the freshman senator from Arkansas when he sought to amend the Surplus Property Act of 1944 to achieve two goals: to use the foreign credits that were accumulating in other countries from the sale of surplus war properties overseas; and to encourage the international exchange of scholars. It was a small ticket item that easily passed Congress and was signed into law by President Truman in August of 1946. In the early years, foreign currency that would have been difficult to bring to this country was spent to support scholars traveling both to and from the United States, but by 1948 Congress approved the United States Information and Educational Exchange Act, which assured continued funding in US dollars.

The program has grown and flourished, and yet it is still a bargain in terms of accomplishments and expenditures. In its 46 years of existence, there have been some 185,000 participants in Fulbright programs - 62,000 from the U. S. going abroad and 123,000 from other countries to the United States. A grand total of roughly $ 1.3 billion has been spent on all aspects of the program through its whole history - about the cost of two Stealth bombers. Another way of looking at the cost would be to say that the world spends more in one hour on military expenditures than the Fulbright program spends in a year.

Approximately 1,000 American faculty members and professionals go to more than 100 countries on lectureships or research projects each year. In any typical year, about 1,200 foreign scholars come to this country on research or lecturing grants. The largest category of the program is that of student exchanges, where 550 new grants to US nationals and 1,300 new grants to foreign nationals are added to about 650 renewal grants for foreign students to extend their graduate studies in this country. One program that I was unaware of sends some 350 elementary and secondary teachers to teach abroad, and brings about 250 teachers from other countries to teach in our schools.

Among the characteristics of the Fulbright program that set it apart and helped assure both its early and its ongoing success was its binational character. It has also been buffered, if not protected, from government control both at home and abroad by the composition of the boards chosen to administer the programs. In the countries where most programs take place, binational Fulbright agreements have been signed, while in other countries the USIA officers in the American Embassies perform coordination activities. These commissions nominate Fulbright scholars and students to come to the United States and also serve as contacts for universities and other agencies that will serve as hosts for American Fulbright students, researchers, and lecturers who will come to their countries. In several countries, especially those of Western Europe, participating governments have made substantial cost-sharing contributions to support Fulbright exchanges in recent years. In addition to direct financial contributions, most of the 120 participating countries offer a variety of other types of support for Fulbright recipients, such as subsidized housing on university campuses or elsewhere.

CURRENT RESEARCH AND LECTURING AWARDS

The handout that is being circulated consists of photocopies taken from the 1993-94 booklet describing awards for faculty and professionals. The booklet itself is 136 pages in length, and is available either from the Fulbright advisor on your campus, or through the address on the first page of the handout. I have copied a few excerpts to give you a very brief idea of how the information is arranged, as well as giving you the opportunity to judge whether you might wish to pursue the possibility of applying for a grant this year or in the future.

The second page of the handout is included to explain the abbreviations, but also to give you an idea of the number of countries which are offering broad nondisciplinary or multidisciplinary awards. The third page is taken from the "Discipline" index. From this index you would consult the entries filed under the specified countries, examples of which are to be found on pages 4 and 5. The Czech and Slovak Federal Republic entry shows the very general awards for which librarians could apply, along with academics and professionals from any number of fields.

Page 5 of the handout shows the type of award which is a bit more specific in nature, and which is probably easier to visualize for most of us upon first exposure to the process. Under "Costa Rica" there is a statement of expectations and benefits and an application deadline, followed by a series of paragraphs describing needs that have been identified by agencies in the host country. Incidentally, some degree of fluency in Spanish is likely to be required for service in Latin American nations, and French may be expected for service in the former French colonies of Africa. In most other cases, language facility may be preferred, but is seldom required.

The final page of the handout contains responses to a series of questions that may prove helpful to people who are thinking about the possibility of applying for a Fulbright grant.

MY EXPERIENCES IN ECUADOR

As promised in the abstract circulated earlier, this section will be very brief, indeed, but I think that a summary of my activities in the library program in Ecuador may give an idea of the sort of thing one might expect. It had never occurred to me to think about a Fulbright for a librarian, until I talked with a good friend, then at the University of Oregon and currently at American University, who had just finished a Fulbright lectureship in Ecuador and was wildly enthusiastic about it. We talked at an ALA Annual Conference, and as soon as I returned to my campus I found the program description in the booklet and filled out the application materials. Since the application was going to be received a bit after the published deadline, I called the person listed at the end of the award description. I found him to be very helpful, supportive, and encouraging in this as in every contact I have ever had with Fulbright representatives in this country or abroad. For some reason I had a Midwesterner's suspicion of them as being stuffy and pretentious, but I could not have been more mistaken.

Early dealings were with the Council for the International Exchange of Scholars, out of Washington, D.C. After I had cleared the first steps of the screening process, most subsequent correspondence was with the Comision Fulbright in Quito, Ecuador. I soon learned that mail service in both directions of this interchange was abysmally slow, but that FAX service was outstanding.

After I was informed that I had been selected for the lectureship, negotiations progressed by fits and starts. It was clear when I reached Ecuador that this was more a reflection of a program being designed and executed on the fly than of any excessive bureaucracy or procrastination on the part of the people in Quito. I scheduled three different sets of dates for my lectureship, and the first two times the folks in Ecuador asked if I could put it off for just a bit longer. Fortunately, both my departmental colleagues and my library administration were totally supportive during these frustrating times.

Eventually, though, I reached Quito. I was to be the first Fulbright lecturer in an ongoing two-year program designed to update and upgrade the skills of practicing librarians. There are very few people in Ecuador who have degrees in Library Science - virtually all library education consists of on-the-job training. Let me hasten to say, though, that my students and all the people with whom I worked are dedicated, enthusiastic librarians, but librarians who have not had the opportunity to study librarianship in a formal setting. This program in which I participated was designed by four leaders to address this need.

There had been active recruiting among library workers, and a selection process had narrowed the pool to 50 participants. Each had passed qualifying tests and interviews, and each had paid a registration fee - no small consideration in an underpaid profession within a developing country. Each was a full-time worker in a library.

I taught one group from 7-9 each morning, five days a week, and afterwards they went to work. The other group worked all day, then came to my class from each day from 6-8 PM. They also spent one additional hour each day in class, which rotated among cataloging, library administration, and English for librarians. I talked with them about the automation of library processes, though for almost all of them it was their first exposure to many of these concepts. A few used computers in some aspect of their work, but only two of the over 40 libraries represented had access to any type of CD. I had arranged with SilverPlatter to take along a loaned copy of ERIC on CD, along with the necessary software. Since online access to bibliographic databases such as BRS or DIALOG would be prohibitively expensive, I urged them to consider CDs as a possible alternative for the future.

All libraries I have ever known complain about lack of resources. Spending time in a developing country can give one a wrenching perspective to such complaints. I wrangled invitations to visit the libraries of virtually all of my students. I visited academic libraries, public libraries, special libraries, and one school library. Let me stress again the devotion and dedication of these librarians, because for many, that dedication was their main resource. In perhaps the most dramatic case, one of my students worked at a university that had an enrollment of 5,000 students, and its library owned 4,000 volumes.

Virtually all libraries in Ecuador are closed stack. It was startling to walk into the children's section of the National Library. At first glance it could have been the children's section of any medium-sized branch of a US public library, with colorfully painted murals and posters, stuffed animals on top of the bookshelves, and small children looking at picture books - until you notice that it has closed stacks. Neither children nor parents are permitted to browse.

Ecuador, as with with so many developing countries, gets hit twice by the system: first, libraries have only a small fraction of the money that we do to spend on materials; and second, those materials are much more expensive there than here in actual terms - that is, while some costs of living are lower there than here, the cost of books is substantially greater.

CONCLUSION

Though I said that I would keep the description of my own experiences brief, you can see that I tend to get carried away. This was one of the most exciting and rewarding experiences that I have ever had, both professionally and personally.

There are other opportunities, as well, for library exchanges. One that many of you have read about is the ALA/USIA Library/Book Fellows Program. This program selects and supports 15 librarians to participate in overseas assignments for specific projects of four to twelve month's duration.

Each of you knows a great deal more than you may give yourself credit for - I would encourage you to think about sharing some of that expertise with others. Traveling abroad can be a wonderful and fascinating experience, but working abroad can be even more rewarding, in that you come closer to being a part of the culture that you are visiting.

Fulbright grants and awards represent a broad range of opportunities for librarians as well as other faculty and professionals, and I would encourage each of you to think about whether you might enjoy participating in an overseas professional activity of this sort.

BIBLIOGRAPHY

Vogel, Ralph H. "The Making of the Fulbright Program". ANNALS of the American Academy of Political and Social Science, Vol. 491, May 1987. pp. 11-21.

FULBRIGHT SCHOLAR PROGRAM

GRANTS FOR FACULTY AND PROFESSIONALS

1993–94

Council for International Exchange of Scholars
3007 Tilden Street, N.W., Suite 5M
Washington, D.C. 20008-3009

Affiliated with the American Council of Learned Societies

Research and Lecturing Awards

The Fulbright Scholar Program is administered by CIES under a cooperative agreement with the United States Information Agency.

The following index profiles the 1993-94 award opportunities by major discipline. Please note that many countries offer awards that are open to many disciplines or that are titled "Any Field" and are not restricted by discipline.

Key to abbreviations: (r)–research award, (l)–lecturing award, (lr)–lecturing/research award, (dl)–distinguished lecturing award, (jr)–junior research award, (jl)–junior lecturing award, (t)–travel-only award, (sp)–special program.

Open to Many Disciplines or Any Field

African Regional Research Program–any field (r)
Albania–any field (r); any field (l); special lectureships (sp)
Algeria–any field (r); any field (lr); any field (sp)
Argentina–social sciences/humanities (lr)
Australia–any field (lr); social sciences/humanities (lr)
Austria–any field (r)
Bahrain–any field (l); any field (lr)
Bangladesh–any field (r); any field (l)
Belgium/Luxembourg–any field (r); any field (t)
Belize–social sciences/humanities/sciences (l)
Brazil–any field (lr)
Bulgaria–any field (r); any field (l); special lectureships (sp)
Burundi–any field (l)
Canada–any field (lr)
Chile–any field (lr)
Colombia–any field (l); humanities (l); social sciences (l)
Czech and Slovak Federal Republic–any field (r); any field (l); special lectureships (sp)
Denmark–any field (t)
Ecuador–any field (r)
Egypt–any field (r); any field (r); any field (l); any field (lr); U.S.-Egyptian Partnership Program (sp)
Ethiopia–any field (l)
European Regional Research Program–European history, politics, society, culture (r)
Finland–any field (r)
France–any field (r); any field (t)
Germany–any field (lr); any field (jr); any field (t)
Greece–any field (r); any field (l)
Guatemala–social sciences/humanities/sciences (l)
Guinea–any field (l)
Hungary–any field (r); any field (l); special lectureships (sp)
Iceland–any field (r)
India–any field (r); any field (l); any field (lr); any field (t)
Indo-American Fellowship Program–any field (r)
Indonesia–any field (dl); social sciences/humanities (l)
Ireland–any field (lr)
Israel–any field (r); any field (l)
Italy–any field (r); any field (jr); any field (t)
Japan–social sciences/humanities (l); Japan Today (sp)
Jordan–any field (r); any field (l); social sciences (lr); social sciences/humanities (sp)
Korea–social sciences/humanities (dl); social sciences/humanities (lr)
Malaysia–Malaysian studies (r)
Malta–social sciences/humanities (l)
Mauritania–any field (r); any field (lr)
Mexico–any field (r); any field (l); Fulbright Border Program (l)
Morocco–any field (r); any field (l); any field (lr); any field (sp)
Nepal–any field (r); any field (lr)
Netherlands–any field (lr)
New Zealand–any field (t)
Nicaragua–social sciences (lr)
Nigeria–any field (l)
Norway–any field (r)
Pakistan–any field (r); any field (lr)
Panama–any field (jl)
Paraguay–social sciences/humanities (lr)
Peru–any field (l); any field (lr)
Poland–any field (r); humanities/social sciences (l); science/mathematics (l); special lectureships (sp)
Portugal–any field (lr)
Qatar–any field (lr)
Romania–any field (r); any field (l); special lectureships (sp)
Saudi Arabia–any field (lr)
Senegal–any field (r); social sciences (l)
South Africa–any field (lr)
Spain–any field (r)
Sri Lanka–any field (lr)
Sudan–any field (l); any field (lr); any field (sp)
Sweden–any field (lr)
Syria–social sciences/humanities (sp)
Taiwan–Chinese studies (r); social sciences/arts/humanities (lr)
Tanzania–any field (l)
Togo–any field (l)
Tunisia–any field (r); any field (l); any field (lr); any field (sp)
Turkey–any field (r); social sciences/humanities (l)
Uganda–any field (l)
United Arab Emirates–any field (lr)
United Kingdom–any field (r); any field (lr); any field (sp)
Venezuela–any field (l); social sciences (l)
West Bank–any field (lr); social sciences/humanities (sp)
Yemen–any field (lr)
Yugoslavia–any field (r); any field (dl)

Professionals

(Professionals and artists outside academia may be particularly suitable for these awards; consult with the appropriate program officer before proceeding. Please note that professionals may also apply under other award openings.)

Albania–any field (l); business administration, general management, finance, accounting, management systems (l); communications/journalism, broadcast journalism, print media (l)
Argentina–public health planning and administration, maternal/child care (l)
Australia–environmental law and management (lr); international trade issues (lr); visual and performing arts, music, theater (lr)
Bolivia–art and textile preservation, museum administration, art history (lr); museum administration, art, art history (lr)
Bulgaria–international business, international finance, marketing, organizational theory/behavior, strategic planning, operations management, operations policy, management information systems, technology management, principles of accounting (l); special lectureships (sp)
China, People's Republic of–communications/journalism, news writing and reporting (l)
Colombia–public administration, law petroleum engineering, environmental engineering, agricultural sciences, urban and regional planning (l)
Costa Rica–performing arts: acting and directing for theater, dance, and opera (l); restoration and preservation of historical documents (l); urban design (lr)

Library Science

African Regional Research Program–(r)
Albania–(l)
Argentina–(lr)
Australia–(lr)
Austria–(r)
Bulgaria–information systems (l)
Central American Republics Research Program–(r)
Colombia–(l)
Costa Rica–restoration of historical documents (l)
Czech and Slovak Federal Republic–(r)l)
Egypt–(r); (l); (lr); U.S.-Egyptian University Partnership Program (sp)
El Salvador–(lr)
Greece–(r); (l)
India–(r); (l); (lr); (t)
Israel–(l)
Jordan–(sp)
Kenya–information organization and retrieval, library automation (l)
Mexico–(l)
Middle East, North Africa, South Asia Regional Research Program–(r)
Morocco–(r); (lr); (sp)
Peru–(l)
Poland–information retrieval, international information systems, library administration, library automation, acquisitions (l)
Qatar–Arabic collections (lr)
Romania–information retrieval, library automation, library administration (l)
Saudi Arabia–(lr)
Sierra Leone–(lr)
Spain–(r)
Sudan–(l); (lr)
Sweden–corporate information management, business information technology, office information systems, records management (lr)
Syria–(sp)
Tunisia–(r); (l); (lr); (sp)
Turkey–(r)
United Kingdom–archives, American culture, library administration (sp); librarian or archivist with American studies background (sp); librarians at colleges/universities or major research institutions, library administrators, or archivists (sp)

Czech and Slovak Federal Republic

Fifteen awards, including at least 4 lecturing awards in American literature and language, and 2 or more research awards in any field. Academic year is 9/93 to 6/94. Opportunities are available for teachers at the G level and for persons with broad experience teaching in the liberal arts at the UG level. Lecturers are welcome to assist with curriculum and program development and to join colleagues in research. Applicants may list the host institution affiliation preferred. English-language school (K-9) is available only in Prague; elsewhere, children can be enrolled in local Czech or Slovak schools. Housing is very difficult for large families, especially in Prague. The local language is normally needed at the time of application for research. English acceptable for lecturing in American language and literature; some knowledge of Czech or Slovak desirable in other fields. Scholars are invited to consult CIES staff before applying.

Lecturers in the Czech and Slovak Federal Republic will receive an allowance enabling them to order, through CIES, books and educational materials needed for lecturing.

CIES program staff:

Georgene B. Lovecky, MaryAnn Cunningham
202/686-6251 or 202/686-6250

Benefits:

Approximately $1,500 to $1,700 per month for researchers and $2,400 to $2,600 per month for lecturers (in U.S. dollars), plus initial allowance of $4,100 to $6,150 to cover such items as international travel, excess baggage, settling in, books, and services, based on number of dependents and grant category (figures quoted are for AY 1991-92). In addition, the Fulbright commission provides a living allowance in an amount that approximates salary levels of local counterparts and will assist with housing arrangements. Tuition reimbursement for accompanying K-12 children to $20,000 for grants of 9 months and over, or $12,000 for grants of 4-8 months.

Application deadline:

August 1, 1992

Research Awards

Any Field. Research applications accepted in all fields. Applicants are requested to specify institution(s) with which affiliation is needed in order to carry out the research proposed. Note: Fulbright researchers can be affiliated with institutes of the Academy of Sciences as well as with institutions of higher learning. Applications for affiliation with institutions outside Prague are encouraged. Two to 10 months; if affiliation sought is a university, period of availability must be during the academic year. (Award code #3180)

Lecturing Awards

Any Field. Applications welcome in all fields. Scholars in fields other than those awards described below are welcome to apply. Continuous curricular changes in the Czech and Slovak Federal Republic suggest that other disciplines will be of equal interest. Applications for affiliation with institutions outside Prague are encouraged. One or 2 semesters, beginning 9/93 or 2/94. (Award code #3181)

Agriculture. Lecture in any specialization. Universities of agriculture in Prague, Brno, Nitra. One or both semesters, beginning 9/93 or 2/94. (Award code #3182)

American Literature. Teach American literature or combination of American literature and conversation courses (American studies materials may be used for conversation courses). Charles University, Prague; Masaryk University, Brno; Comenius University, Bratislava; Palacky University, Olomouc; Safarik University, Presov; University of West Bohemia, Pilsen. Nine months, beginning 9/93. (Award code #3183)

Business Administration. Teach courses in any specialization of business and management. Charles University, Prague; Prague School of Economics; Bratislava School of Economics; Comenius University, Bratislava; other affiliations possible. One or both semesters, beginning 9/93 or 2/94. (Award code #3184)

Communications/Journalism. Lecture in basic journalism. Charles University, Prague; Comenius University, Bratislava; Palacky University, Olomouc. One or both semesters, beginning 9/93 or 2/94. (Award code #3185)

Computer Science. Lecture in any specialization. Masaryk University, Brno. One or both semesters, beginning 9/93 or 2/94. (Award code #3186)

Economics. Teach various aspects of the field. Applications encouraged from comparative economists who are prepared to teach on the U.S. economic system: Charles University, Prague; Prague School of Economics; Bratislava School of Economics; Comenius University, Bratislava; other affiliations possible. Agricultural economics and marketing: Universities of agriculture in Prague, Brno, Nitra. One or both semesters, beginning 9/93 or 2/94. (Award code #3187)

(CONT'D.)

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Costa Rica

Up to 2 lecturing and 6 lecturing/research awards. Fluent Spanish required for some awards. (See also research opportunities under the Central American Republics Research Program on page 30.)

CIES program staff:

Anita Caplan, Amelia D. Saunders
202/686-6238 or 202/686-6233

Benefits:

Approximately $2,600 to $3,300 per month (in U.S. dollars), plus initial allowance of $3,000 to $4,000 to cover such items as international travel, settling in, books, international shipment of educational materials, and services, based on number of dependents and category of grant. Reimbursement for actual tuition expenses for accompanying K-12 children up to $12,000 per family for grants of 9 months or longer; $8,000 is the maximum for grants of 4-8 months.

Application deadline:

August 1, 1992

Lecturing Awards

Performing Arts. Teach introductory and advanced courses in acting and directing for theater, dance, and opera, and assist in training of staff. Team teaching possible. M.A.or M.F.A. and 2 years of teaching experience desired. Moderate Spanish required, but fluent Spanish preferred. School of Performing Arts, National University, Heredia. Six months, beginning 7/93. (Award code #3156)

Restoration of Historical Documents. Assist in restoration training at the National Archives of Costa Rica. Teach practices and techniques of restoration and preservation of documents and assist in training programs. M.A. or Ph.D. preferred. Moderate Spanish required. School of History and Geography, University of Costa Rica, San Jose; National Archives of Costa Rica. Six months, beginning 7/93. (Award code #3157)

Lecturing/Research Awards

American Literature. Teach G and UG courses in 19th- and 20th-century American literature and modern literary criticism. Some outside lectures. Research encouraged in areas such as attitudes toward literature. Ph.D. and more than 5 years of teaching experience preferred. Fluent Spanish preferred, but not required. Department of Modern Languages, University of Costa Rica, San Jose. Six months, beginning 7/93. (Award code #3158)

Business Administration. Teach a G course (strategic marketing, organizational behavior, financial management, or managerial accounting), and assist in curriculum development and staff training in the M.B.A. program. Help prepare cases for study. Conduct research in general business, accounting, or marketing. M.B.A. or M.A. and 5 years of teaching experience preferred. Fluent Spanish required. School of Business Administration, University of Costa Rica, San Jose. Six months, beginning 7/93. (Award code #3159)

International Economics. Teach G course in 1 of the following: international trade and finance, environmental economics, development economics, labor economics, public finance, or open economy macroeconomics. Supervise master's theses in the M.A. program in political economy. Conduct joint and individual research in international, labor, and environmental economics. Ph.D. and 2-3 years of teaching experience required. Fluent Spanish required. National University, Heredia. Six months, beginning 7/93. (Award code #3160)

International Relations. Teach UG course on international economic relations, foreign policy, international cooperation, or U.S.-Latin American relations and a special G course on foreign policy/diplomatic bargaining. Research opportunities on U.S.-Costa Rican relations. Ph.D. and 5 years of teaching experience preferred. Fluent Spanish required. National University, Heredia. Six months, beginning 7/93. (Award code #3161)

Political Science. Teach G courses (political methodology, political theory, or recent trends in political science); assist G students in research design; and participate in M.A. program academic council. Research opportunities. Ph.D. and rank of associate professor required. Fluent Spanish required. Department of Political Science, University of Costa Rica, San Jose. Six months, beginning 7/93. (Award code #3162)

Political Science. Teach G course in international relations (negotiations, conflict resolution, or international relations) and advise G students doing research in the M.A. program in political science. Research opportunities available. Ph.D. and rank of associate professor required. Fluent Spanish required. Department of Political Science, University of Costa Rica, San Jose. Six months, beginning 7/93. (Award code #3163)

U.S. Culture/TEFL. Team-teach UG course on U.S. culture, and a course on teaching culture to in-service teachers. Participate in workshops and work
sessions to develop EFL curriculu
Research opportunities available
Costa Rican culture and developm
of cultural materials for Spanish-l
guage programs for the U.S. Spanis
helpful, but not required for teachi
National University, Heredia.
months, beginning 7/93. (Award cc
#3164)

Urban Design and Planning. Coll
orate with university faculty in seve
research projects on urban sustaina
growth, especially natural systems
human settlements. Also, teach 1
vanced-level course in physical pl
ning, urban design, or planning me
odologies. Give some lectures to fi
professionals, as well as to G and
students. Ph.D. preferred; Master
City Planning minimum. Fluent Sp
ish required. Department of Transp
tation and Urban Studies, Univers
of Costa Rica, San Jose. Six mont
beginning 7/93. (Award code #31

Cote d'Ivoire

Two or more lecturing or lecturing/
search awards for the academic y
9/93 to 6/94, from the fields listed
low. (See also research opportuni
under the African Regional Resea
Program on page 29.)

CIES program staff:

Linda Rhoad, Lilee Perera
202/686-6230 or 202/686-4027

Benefits:

Approximately $3,660 to $3,860
month (in U.S. dollars), plus initial
lowance of $5,030 to $8,400 to co
such items as international travel,
cess baggage, and other one-time
penses, based on number of dep
dents. Tuition reimbursement
accompanying K-12 children
$12,000 for grants of 9 months a
over, or $8,000 for grants of 4
months. Deductions are made wh
the host institution provides a lo
salary, international travel, or ho
ing.

Application deadline:

August 1, 1992

Lecturing Awards

American Civilization. Teach UG
courses, supervise student and jun
staff research, and consult on curric
lum development. Opportunity for
search on black music and religion
America. Candidates with Ph.D. a
considerable teaching experience
preferred. Classes taught in Englis
conversational French required. N
tional University of Cote d'Ivoi
Abidjan. Ten months, beginning 9/9
(Award code #3166)

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1. **How strict are the deadlines?**

   The deadlines indicated in this awards book are firm. However, some awards may not draw a sufficient number of applications by the deadline. The "Update of Available Awards," published in the early fall and distributed to campus contacts and department chairs in selected disciplines, lists awards still available for which late applications will be accepted. Most of the awards still available at that time are for lecturing.

2. **May I apply for more than one opening?**

   No. Applicants must apply for only one award in one country, but they may list alternate countries in the space provided on the application. (Applicants for Africa are especially encouraged to do this.) In the event that applicants are not nominated for their first-choice award, they may contact CIES and ask whether their applications can be considered for other openings that may still be available.

3. **How important is an invitation from a foreign institution?**

   Invitations from foreign institutions may be helpful in demonstrating the feasibility of a given proposal, but they do not assure the awarding of a grant. Applicants, particularly for research awards, are encouraged to investigate foreign institutional settings that will enable them to carry out their research plans. Many "Any Field" award offerings may require invitations for lecturing assignments.

4. **How competitive is the program?**

   The level of competition varies among country programs and award offerings. As a general rule, many countries in Europe and several countries in the Pacific regularly attract a large number of highly qualified applicants. The competition in other regions can often be less stiff, and the prospects for a grant may be more favorable. Applications to developing countries are especially encouraged. Even for highly competitive countries, certain awards may be in great demand, while others are undersubscribed. In all countries research awards tend to be more competitive than lecturing or lecturing/research awards. CIES program officers listed for each country can assist applicants in determining appropriate award opportunities.

5. **Does the Fulbright Program want only tenured faculty?**

   No. Untenured faculty and professionals outside academe are urged to apply. Scholars who are not on tenure-track appointments or who are not affiliated with an academic institution are awarded Fulbright grants in every competition cycle. Also, a large number of lawyers, journalists, artists, and other nonacademic professionals regularly receive Fulbrights. Some college or university teaching experience, however, is usually expected for lecturing appointments.

6. **Are grants always for a full academic year?**

   No. Grants may range in duration from three months to twelve months, as specified in the description of each opening. Lecturing awards are often for a semester or an academic year, while research awards tend to be more flexible.

7. **Are Fulbright grants for lecturing only?**

   No. Of the approximately 1,000 awards available, about 300 are for research. Also, there are a number of combined lecturing/research awards that provide lecturers time for research activity. Many Fulbright scholars have been able to produce significant research while on lecturing awards.

8. **How many times may I be awarded a Fulbrigh grant?**

   Preference is given to applicants who have not previously participated in the program. Applications fro Fulbright alumni are considered, especially for lecturin awards, but three years must elapse between the endin date of one grant and the beginning of a subsequen grant.

9. **If I was not successful in a past competition, should I bother applying again?**

   Yes. Applicants for a given year may face heavier competition than for subsequent years. The dynamics of the competition vary from cycle to cycle and reapplication are often successful.

10. **Is it necessary to be fluent in the language of the country?**

    In most countries the language of instruction for Fulbright lecturers is English. Thus, applicants for lecturing awards have a very broad range of countries for which they can apply. The exceptions are Central and South America, where Spanish is usually required, and francophone Africa, where one is expected to be fluent in French. For research awards, one must have a sufficient command of the host country language to be able to work well with primary research materials. Any language requirements will be specified in the description of the award.

11. **Must I have past foreign experience to be seriously considered?**

    No. One of the goals of the program is to afford opportunities to individuals who have not had exchange experience.

12. **If I do not see an award listed that exactly matches my background, should I bother applying?**

    Yes. A large number of awards are designated "Any Field," which means that applications in all disciplines are encouraged. Also, some awards may be fairly broad in their descriptions, even within a selected discipline, and any specialization is considered.

13. **Are there guidelines available for persons who are applying for the first time?**

    Yes. CIES has prepared the *Applicant's Handbook* to provide general advice, dos and don'ts, and other assistance for individuals who are filling out the application form. The *Handbook* is included in the application packet. Separate copies can also be obtained directly from CIES or from a college or university's international office.

14. **What do stipends cover, and why do they appear to vary so much from country to country?**

    Stipends are designed to cover the cost of living in host countries (for example, food, lodging, incidental expenses, etc.). Therefore, stipends vary as the cost of living in individual countries varies

15. **If I am interested in a particular country or area, but would like to know more about the teaching and living conditions there, can CIES put me in contact with former grantees?**

    Yes. CIES staff are very willing to put potential applicants in touch with former grantees to a particular country, and to help in any other way that might provide information on country conditions.

NEBRASKA ONLINE:
THE NEBRASKA DEVELOPMENT INFORMATION PARTNERSHIP

Vern Buis
Mary Jo Ryan
Rod Wagner
Nebraska Library Commission
Lincoln, Nebraska

ABSTRACT

Nebraska Online is an electronic information service (EIS) created to support information needs for economic development and for library applications. Libraries are key intermediaries in providing access to information resources. Development of the EIS is an outgrowth of the Nebraska Pre-White House Conference on Library and Information Services and collaborative activities of the Nebraska Library Commission and the Rural Development Commission. The EIS is intended to provide easily accessible information to aid development professionals, community leaders, and others involved in economic and community development activities.

Electronic information services have been in use for many years. Librarians have commonly tapped remote databases for research and reference purposes. These services have evolved and proliferated. Electronic information resources and services have rapidly increased in use to the point that they have become the dominant means of managing information resources for many libraries. An elaborate electronic communications web has evolved that allows international connection. With the right knowledge and resources virtually anyone can move into and out of these networks. Libraries are a source for aid to those people who have neither the knowledge or the means to tap these networked information resources.

Nebraska Online is an electronic information service developed by the Nebraska Library Commission to support economic development initiatives and to supply access to unique information. The roots of **Nebraska Online** can be found in statewide strategic planning efforts that have occurred during the late 1980's and into the 1990's, culminating in the Nebraska Pre-White House Conference on Library and Information Services. The conference theme, *Nebraska Information Partnerships*, indicated the expectations for future initiatives. In addition, the Nebraska Educational Information Center Network, a program funded through the W.K. Kellogg Foundation, has provided important experience and resources to the development of **Nebraska Online**.

Origin

The farm crisis that emerged in the 1980's led to an examination of Nebraska's economic climate and future. A private sector initiative grew out of a study commissioned by the Nebraska Press Association and financed by the Peter Kiewit Foundation. The economic study and its recommendations were prepared by SRI International in their reports: *New Seeds for Nebraska* and *Moving the Agenda Ahead.* Nebraska Futures, Inc., a privately supported organization, was formed to put together an action agenda in response to these reports. A ten part action agenda emerged from their efforts, including:

- Comprehensive Educational Enhancement
- Unrivaled Statewide Access
- Innovative Training Partnerships
- Innovative Community Partnerships
- Strong Cross-State Connections
- Growth of High-Value-Added Agriculture and Food Processing
- Innovation in Diversified Manufacturing
- Expansion of the Service Economy
- Commitment to Homegrown Entrepreneurship
- Strong Collaboration Between Higher Education and Business[1]

Public and private partnerships, information and communications were identified as critical requirements for moving Nebraska forward in a global economy. The interlibrary communications system and the information resources accessible through Nebraska libraries were seen as valuable to the success of these economic initiatives.

Nebraska Futures, in their report *Nebraska: Leading the Great Plains in the New Economy*, identified unrivaled statewide access as a critical element of the action agenda. The following statement was included in their report:

> "To ensure that people in every corner of the state are especially well prepared to lead in the new economy, Nebraska must provide the highest level of access to information and education of any state in the region."[2]

A second strategic planning initiative, the Legislature's *New Horizons for Nebraska*, contributed additional input to the *Nebraska Information Partnerships* conference. Public and private partnerships were recognized as critical to successful ventures. One of the underlying assumptions of the recommendations from the *Nebraska Information Partnerships* conference was the following:

> "That increased access to resources and services for all Nebraskans, regardless of economic status, geographic location, gender, age, literacy level, ethnicity, physical or mental disability, or other relevant factors, will continue to be of concern in the design and delivery of library and information service. This assumption also encompasses the need for information to be available in appropriate formats and through a variety of delivery systems -- from the library to the 'backpack'."[3]

A further assumption was that "development of universally accessible national and international electronic information networks is necessary and desirable to optimize services to Nebraskans."[4]

Public and private partnerships, rural issues, information resources and networking all contributed to initiatives which grew out of the *Nebraska Information Partnerships* conference. Early contacts with key aides to Nebraska's new Governor, Ben Nelson, contributed to involvement of the Nebraska Library Commission in rural development and statewide economic development actions. A team of Nebraskans who participated in a 1989 conference in Colorado, *The Role of Information in the Economy of the West*, was an interesting group in that among the participants were a State Senator, Sandy Scofield, who became the Governor's Chief of Staff, and Steve Buttress, who became the Director of the Nebraska Department of Economic Development. The conference contributed ideas and foundation for the *Nebraska Information Partnerships* conference.

A meeting with Don Macke, appointed by Governor Nelson to serve as Director of the Rural Development Commission, met with Library Commission staff in March, 1991, to discuss results of the *Nebraska Information Partnerships* conference and implications for rural Nebraska. Those discussions led to a concept paper, drafted by Macke, which became a planning focus for further efforts. Macke's paper, *Nebraska's Development Information Partnership*, was the basis for discussion with a planning group which included Library Commission staff Nancy Busch and Rod Wagner, Bill Miller, Director of the State Division of Communications, Joan Giesecke, UNL Libraries Associate Dean, Steve Williams, head of the Department of Economic Development's One-Stop Business Assistance unit, Jerry Deichert, UNO Center for Public Affairs Research, and Don Macke.

In his paper, Macke presented the proposition that ". . . usable, accurate," timely, affordable, accessible information . . . is a fundamental cornerstone of successful development in communities across Nebraska."[5]

The Development Information Partnership was conceived as a key component of a broader based initiative, the Nebraska Development Network, an initiative coordinated by the Nebraska Department of Economic Development. Meetings of potential partner agencies, public and private, were convened to test the assumptions, interest, and climate for support of the Development Information Partnership. The response was positive.

Nebraska Online

Nebraska Online emerged from several months of meetings and discussions as an information and communications backbone for the emerging

Nebraska Development Network. Key components of the information service were identified. The library communications network was seen as a key asset to development efforts, with libraries as access points for information resources. Key functions were identified to include an events calendar, a directory to other Nebraska electronic information services, electronic publishing, electronic mail and conferencing, and a services directory. **Nebraska Online** was adopted as the name for the new information service.

A key piece of **Nebraska Online** is the services directory. The directory was developed as part of the Kellogg Foundation funded Nebraska Educational Information Center Network by Library Commission staff member Steve Jonas working with Mary Jo Ryan, Director of the Nebraska Educational Information Center Network. The services directory was designed as a database of Nebraska based human resources and community service organizations and agencies. The information content and the searching capabilities offered an important information resource for the Network.

The original concept called for development of a bulletin board, using standard bulletin board software: RBBS. RBBS directly supports many of the major functions that were envisioned: electronic mail, conferencing, public bulletins, and file transfer. Research suggested that other functions, including database searching, and CD-ROM access could be accommodated via the RBBS "Doors" feature.

As installing and testing RBBS began, a number of deficiencies surfaced.

The "Doors" feature proved to be extremely limited in its capabilities. Further, the user interfaces of the electronic mail, bulletins, and other built-in features were not well-suited to the target audience.

It was believed from the start that a system such as **Nebraska Online** could only be effective if it would be easy to learn and use. RBBS, like virtually all BBS systems, has its roots in the hacker techie realm. It offers power and features well-suited to the needs of knowledgeable computer users, but not to general audiences.

The Commission's Computer Applications Team agonized for some time over ways to overcome the technical deficiencies and interface problems inherent in RBBS. Eventually they came to believe that using RBBS as the basis for **Nebraska Online** would be a square peg round hole proposition at best.

Other alternatives were explored, including mainframe-based options, other BBS software, and a range of microcomputer software/hardware possibilities. In the course of this process, it was concluded that no really good solution was possible within the level of funding and staffing that were available.

A breakthrough occurred with consideration of the possibility of expanding the scope of **Nebraska Online** beyond its Development Information Partnership mission. The Commission had a number of other projects on its agenda that could logically be brought together in an expanded **Nebraska Online**. This would allow the staff and funding resources targeted for these other services to be combined with those set aside for **Nebraska Online**. This would also permit hardware, software, and telecommunications facilities to be shared.

These other projects included an effort to provide for remote access to the new Library Commission online public access catalog (OPAC) for libraries and for the Commission's state government clientele. Alternatives were explored to the mainframe-based NELCMS, which provides electronic mail, access to state databases, and a library calendar/bulletin board. Not only is the mainframe-based NELCMS expensive and difficult to maintain, it is also very limited in the services it can support. It cannot, for example, support remote access to CD-ROM, software upload/downloading, non-mainframe database searching, and Internet access, among other functions.

The concept of **Nebraska Online** is to build a system using standard, off-the-shelf microcomputer hardware and software throughout. This allows taking advantage of the massive base of personal computer hardware and software, and its competitive pricing. Further, products can be acquired based on features and performance, rather than on the basis of obscure technical compatibility issues. And, databases can be readily shared and other services developed for in-house use on the Library Commission's local area network (LAN) with users statewide.

Marketing and Education

Nebraska Online marketing activities began early in the planning process. Rural Development Commission staff worked with staff of the Department of Economic Development to identify the most pressing information needs of Nebraska's development professionals, paraprofessionals, and volunteers across the state. It became clear that many of the most pressing needs could be met with an adaptation of the services directory. **Nebraska Online** was conceived of as a service that could meet that need and several others.

To begin developing a marketing strategy, the Commission brought together a variety of people to serve as a core group for planning and implementing marketing activities. The group included representatives of a number of state and local agencies and organizations, representing the groups that will be responsible for implementing marketing strategies, as well as the target groups that marketing efforts will be directed toward. The group agreed to address issues related to all areas of marketing, including evaluation and analysis, product development, distribution, outreach, promotion, and training. The marketing goal for **Nebraska Online** is to ensure access and support utilization of electronic information and communication services designed to help Nebraska people, communities, and businesses succeed in a global economy.

The target groups for marketing efforts are listed below in order of priority:

A: INTERMEDIARIES

This group includes librarians, local Cooperative Extension Agents, and local NPPD/REA (and other public utility) staff. It is expected that this group will assist others in the use of the directory and other electronic information services. The group will be expanded to include individuals from a wide range of helping professions and organizations.

B: LOCAL DEVELOPERS

This group includes volunteer and paid personnel of local chambers of commerce, development corporations, and civic organizations. They may access initially through intermediaries. They are expected to be heavy users of the resource directory and calendar, initially, with the hope that they will develop an interest in using the other functions and an ability to access the service directly.

C. INDIVIDUALS CURRENTLY ACTIVE IN THE DEVELOPMENT NETWORK

This includes staff of the Department of Economic Development, the Department of Labor, and the Cooperative Extension Service. This group could represent heavy users of and contributors to the services directory, calendar and newsletter. They are expected to be early adopters.

D. OTHERS/INTERESTED CITIZENS

These individuals may not be part of other systems. They are expected to be computer literate and self-directed. Some will be early adopters. This group may represent the earliest, heaviest utilization of databases and CD-ROM products.

As part of marketing planning, service development is scheduled according to greatest need, with the understanding that some high need services must be developed in Phase II, due to time constraints and programming concerns. The following services are scheduled for immediate release in Phase I:

A. **Development Services Directory**--A Services Directory of statewide or local organizations and services will connect Nebraskans with community, economic, and human development assistance. This information and referral directory can be easily searched by service, city, county, organization or contact person name, or any keyword.

B. **Calendar of Events**--A Calendar of Events, open for listings from all organizations, will keep development professionals and volunteers across the state informed about meetings, training sessions, workshops, and other events. The calendar can be easily searched by date, keyword, or type of event, including Agriculture, Business, Economic Development, Education, History, Humanities, or Libraries.

C. **Electronic Publishing**--An Electronic Publishing System will create a statewide "blackboard" to encourage community-to-community and region-to-region information sharing through a computerized newsletter and press release system.

D. **Bulletin Board Referral System**--A Bulletin Board Referral Directory, listing other computerized communication systems, will refer Nebraskans to a wide range of information from a variety of electronic bulletin boards and other electronic services, including information on business research and development, agricultural development and marketing, educational innovations, and other topics.

E. **Nebraska Development Network description**--Development Network information, describing how the network creates and supports opportunities for regional and local community, economic, and human development, will include instruction on how to best use the information and communication services, as well as a broad range of Network information.

The following services are scheduled for release in Phase II:

A. **Electronic Message Service**--The electronic communication system will serve as a statewide Electronic Message Center, encouraging the exchange of information through instant E-Mail "letters and telegrams" and key-topic conferencing.

B. **Informational Databases**--Information Databases on a wide range of subjects, including census, legislation, marketing, etc., will be available to download on a computer or print on a printer.

A variety of future enhancements are envisioned, including access to a wide range of additional CD-ROM and online databases. **Nebraska Online** is intended to eventually enable international communication access, allowing Nebraskans to interact with other electronic systems around the world.

Initial testing of Phase I services began in March, with the Library Commission staff serving as the beta test group. An external test group, representing other target groups, was formed, with plans for this group to test Phase I services by the end of March.

Initial promotional strategies are aimed at influencing development professionals and a variety of different types of intermediaries. Presentations were conducted at the Development Network Forum and are planned for Nebraska Development Professionals at upcoming regional and statewide meetings. Orientation sessions planned for intermediaries include:

A. Nebraska Community Improvement Program workshops.

B. Nebraska Microcomputer Association conference.

C. Nebraska Library Association Spring Meetings.

Orientations and demonstrations are yet to be scheduled for other key intermediaries.

After orientations are conducted, intermediaries will be cultivated through training efforts, as detailed below:

The Library Commission will provide training for library intermediaries, and will train trainers for other types of intermediaries. Training will include:

1. Satellite session (2 hours) including an overview of the Development Network, a review of the resources, and motivational presentations encouraging intermediaries to initiate partnership activities with the community and the network, including hints on how to establish successful networks.

2. On-site training will be delivered either locally or at events where a number of intermediaries congregate. This "how-to" training will take participants through the steps of accessing, using, and editing entries in the system. It may also include information on using telecommunications

systems in general. Trainers will include Library Development staff and Library System Administrators, as well as others representing other types of intermediaries.

Outreach to solicit a core group of committed, highly skilled intermediaries will include communication of the following expectations. Intermediaries will agree to:

1. Designate an individual responsible for operation of service.
2. Possess a computer system which is adequate for use of the system, and which will be available for both staff and public access use. Must be familiar with telecommunications software and ensure availability of a phone line.
3. Make service available to the public a minimum of five days and twenty-five hours per week.
4. Incur any needed costs for telecommunication.
5. Attend system training sessions.
6. Work actively with other community organization and agencies.
7. Cooperate with merchandizing, promotion, and signage.
8. Provide feedback to the Library Commission and Network.
9. Provide notice if decision is made to discontinue intermediary status.
10. It is preferred that intermediaries have prior experience in the use of automated services (bulletin boards, e-mail, etc.).
11. It is preferred that library intermediaries participate in NEBASE/NEON.

Promotion materials targeted to Intermediaries and Development Professionals will be developed, as will a Speaker's Bureau and Nebraska Development Network orientation package. It is envisioned that this effort will generate mass media activity that will reach all four target groups.

An analysis of these initial efforts will provide guidance and direction for the marketing efforts for Phase II.

CONCLUSION

Nebraska Online offers a new generation electronic information service, serving the needs of statewide economic development activity and library applications. Its flexible design features allow for further development of the information service to add features and functions. It is expected that **Nebraska Online** will help position libraries are key partners in community and economic development activities and contribute to Nebraska's future.

ENDNOTES

1. Nebraska Futures, Inc., Nebraska: Leading the Great Plains into the New Economy (Lincoln, Nebraska: Nebraska Futures, Inc., 1990), pp. 3-4.

2. Ibid., p. 3.

3. Nebraska Library Commission, Nebraska Information Partnerships: A Report to Nebraskans (Lincoln, Nebraska: Nebraska Library Commission, 1991), p.. 17.

4. Ibid., p. 18.

5. Don Macke, "Nebraska's Development Information Partnership: A Concept Paper," (Lincoln, Nebraska: Rural Development Commission, 1991), p. 1.

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THE VIRTUAL LIBRARY: ILLUSION OR REALITY?

Kate Wakefield
Nebraska Library Commission
Lincoln, NE

ABSTRACT

Virtual reality — an artificially constructed "cyberspace" where images, sounds, and other sensory input are produced by computer — creates opportunities for revolutionary developments in library organization and database user interfaces. This technology will allow and may force substantial changes in the way libraries are structured, used, and perceived by an increasingly computer driven society. The first part of this paper explains the current status of virtual reality technology and highlights prototype applications which have already been developed for architecture, medicine, education, and entertainment. The second part extrapolates from them to suggest library and information retrieval applications of this new interactive technology, examining the shift in the fundamental mode of information transfer which is likely to occur.

Virtual reality and the virtual library are frequent topics of discussion in recent technology- and library-related literature. Those academic librarians who subscribe to PACS-L, an Internet listserv-based discussion group, may have participated in a discussion of the virtual library in the early months of 1992. So, exactly what is virtual reality and what possible effect would its widespread adoption have on libraries in the 21st century? This paper offers a review of current literature on virtual reality in an attempt to answer this question.

BACKGROUND ON VIRTUAL REALITY

Definition and Early Pioneers

What is virtual reality? Although the term sounds like an oxymoron (as does its synonym, artificial reality), it can best be described as the creation of artificial worlds which can be entered and manipulated by individuals with the mediation of computer technology. Another term for virtual reality found in much of the literature is cyberspace, implying the exploration of computer-generated three-dimensional space. Virtual reality is so new and hence such a continually moving target that no single authoritative definition of it can yet be made. As with many of the newer computer technologies, such as hypermedia and expert systems, a wide range of products with varying degrees of sophistication lay claim to the same name. In the case of virtual reality, this ranges from interactive workstations which allow limited three-dimensional input to complete 360° tracking of individuals wearing full-body suits.

A simple definition of virtual reality, or VR, is interaction in a simulated or synthesized environment which the user controls, but which is generated by a computer. According to Watkinson, three primary characteristics of full-blown virtual reality systems are: 1) the illusion of depth, produced by stereoscopic viewing of individual images generated for each eye, 2) the illusion of place, enhanced by tracking the user's movements and changing the simulated view accordingly, and 3) interaction with the simulated environment, through a "data-glove" or similar input device (Watkinson, 1990). The ultimate aim of virtual reality, says network guru Charles W. Bailey, Jr., is to "permit users to interact with computer systems in a manner that more closely mimics how humans naturally operate in the real world" (Bailey, 1991, p.33).

Influential predecessors of current virtual reality technology include the Link Aviation Trainer, developed by Edward Link in 1929. This early model of a flight simulator provided realistic instrument readings and mechanically simulated the physical sensations associated with flight. Although no visual images were included, this simulator was interactive and can be considered a rudimentary form of virtual reality. [In a similar vein, the Star Tours ride at Disneyland and DisneyWorld immerses the thrill-seeker in a simulated space shuttle flight, using the power of motion picture level F/X (designed by George Lucas) and a mechanical platform which tilts and shudders synchonically with the image.]

Key to virtual reality's technical development was Ivan Sutherland's 1968 development of a "head-mounted display" (essentially a computer screen integrated into a helmet through a visor or goggles), allowing the user to always have the screen within his field of vision, rather than glancing down at a terminal or control panel. This was the beginning of equipment designed to free the user from being tied to the keyboard and monitor of a typical computer workstation.

Another forerunner of VR was developed by MIT's Architecture Machine Group in 1978 and displayed in 1978-79. Known as the Aspen Movie-Map, this interactive videodisc-based system involved full motion video images of the streets of Aspen, CO, which could be selected among as though one were driving through the city, turning or not as desired at each intersection. Additional features included the ability to choose what season of the year to be viewing, and the supplemental photographs of some historic buildings as they appeared in earlier times, plus the ability to enter selected buildings to see internal views.

Virtual Reality in Fiction

Perhaps the best way to understand where virtual reality is heading is to examine some fictional versions of it. The term "cyberspace" which is often applied to virtual worlds has been borrowed from the 1984 novel by William Gibson, *Neuromancer*, featuring a global matrix which console cowboys "jack into" much as one plugs a pair of headphones into a stereo. Some aspects of the 1983 MGM film "Brainstorm" prefigure virtual reality as well, again featuring a direct link between the computer and the experiential sectors of the brain.

Two of the best current representations of virtual reality can be found in contemporary popular culture. First, the Holodeck on the popular television series Star Trek: the Next Generation, where the ship's computer can create any past or fictional location, all controlled with verbal commands. These holographic scenes are indistinguishable from a real place, including people with which the crew interact and the illusion of a seemingly unending amount of space and resources.

My second example is the feature film "Lawnmower Man" which has little to nothing in the way of plot to recommend it (being an amalgam of several popular 1950's sci-fi themes, including mad scientists, intelligence boosting, and mistrust of government sponsored research), but which includes a neat version of a secret virtual reality lab. Even better yet, several scenes put the audience inside the virtual reality simulation, showing the first graphics I've seen which emulate current computer imaging techniques of textured multiple polygons, "rendered" to recreate the proper shading and reflection of real world 3-D objects.

Current Technology

Obviously direct connection to the brain and completely voice operated computers which can produce convincing three-dimensional interactive holograms are still beyond the capability of current researchers. But for an infant technology using techniques which are only now fully capable of integration, much has already been achieved. Several technological advances have come together to produce the elements necessary to begin to create artificial worlds which can react in real-time with a participant. These include very high speed computers which can handle creation of complex digital graphics, redrawing them at least 30 times per second; software which changes polygons or wireframe drawings into textured, shaded objects; and interface equipment which relay movements to the computer.

The high end of virtual reality is epitomized by Jaron Lanier's Reality Built for Two (RB2) system, which costs upwards of $430,000 (effectively pricing it out of the range of most librarian's budgets). RB2 includes four complex Silicon Graphics workstations, one for each eye of each person involved, and full-body "Data-Suits" to convey extremely detailed movement information to the computer. Lanier and his VPL Research firm is one of the two original co-creators of the data-glove in cooperation with NASA, so it should come as no surprise that NASA's Ames Research Center is conducting similar research with EyePhone and DataGlove-type technology.

However, Lanier owns the patents for much of the standard equipment of virtual reality, including software which is used at other institutions active in virtual reality research, such as the University of Washington's Human Interface Technology Lab (HITL). Lanier is not above selling a cheap version of his glove to Nintendo, resulting in some 60,000 low-tech PowerGloves being sold to game addicts throughout the United States. The technology in the two gloves is different, although the basic principle is the same: the PowerGlove measures simple electric resistance and transmits it with ultrasound, the DataGlove uses hollow tubes with an LED at one end and a photosensor at the other, and transmits the changes through cables, limiting the range of motion for the time being.

CURRENT VR APPLICATIONS

Virtual reality applications have already been developed for a wide variety of fields, serving purposes from training to recreation, and almost every engineering and design function in between. While most of these products are in pre-production stages, many will be on the market sooner than one would believe possible, due to the ever-shortening technological generations. Several are available for top of the line color Macintosh workstations now. For those unfamiliar with recent developments in the field, here are just a few examples:

- Several companies and research labs are working on medical applications for virtual reality, such as programs to train surgeons (Traumabase and the Electronic Cadaver are two brand names) or to allow views of internal organs and ways to manipulate exceedingly tiny surgical instruments.
- The University of North Carolina has developed models of molecules which can be walked through. Similarly, pharmaceuticals companies use virtual models of molecules to search for new drugs of specific molecular structures. "In one case, a large enzyme that contributes to cancer can be inactivated by blocking its so-called active site, where it does the damage, with a small molecule that fits the site perfectly. The first anticancer drugs developed by Agouron Pharmaceuticals of La Jolla, CA, are now being tested" (Bylinsky, 1991, p.150).
- In true American fashion, American VR technological breakthroughs are being brought to the consumer market first by the Japanese. A Japanese corporation, Matsushita Electric Works, opened a showroom "virtual kitchen" in Tokyo in April 1991 to show prospective buyers of custom-built kitchens their dream kitchen. A customer gives the dimensions of her kitchen, chooses the location of appliances and cupboards, and then dons American-built headset and dataglove to move around in the kitchen, even opening up cabinets to be sure the layout will work for her. (Bylinsky, 1991, p.142)
- Boeing is designing virtual aircraft (with the help of the HITL), entering the cockpits and even flying them without ever building them. Expensive glitches can be caught in the design stage, such as when engineer Keith Butler found that no matter how he craned his neck and tried to view one pressure gage in a maintenance hatch, it was obscured from sight. (Bylinsky, 1991, p.142)

- AutoDesk, a Sausalito, CA, firm renowned for its CAD software, has produced a budget version of VR which runs on a 386-PC-based system (approximately $15,000 of equipment). Using two small liquid crystal display screens mounted in a pair of goggles to obtain a 3-D effect, and a Polhemus position-tracking sensor that relays head movements to the computer, this system is limited by its workstation base in the level of graphics which can be produced. AutoDesk's ultimate aim is to make all its CAD products compatible with the virtual software. They already have architectural VR software which allows one to walk through buildings which haven't been built.
- AutoDesk has also set up a lab in a local high school which uses several networked virtual reality workstations to teach driver's education courses. Future applications of this technology could allow students from radically different physical locations to fully participate in a single teleconferenced classroom. (Fritz, 1991, p.46)
- Training and education may be the areas most ripe for VR applications. Visualization of difficult concepts like events on the scale of quantum mechanics has been shown to increase comprehension immensely. Such leaps of understanding are not confined to students, as Eastman Kodak engineers demonstrated, gaining new insights when they used a supercomputer to process complex polymer reactions in three dimensions with multiple variables changing one after the other.
- Researchers at AT&T Bell Laboratories' Machine Perception Research Dept in Holmdel, NJ, are experimenting with using the DataGlove in conjunction with a normal computer screen and voice recognition technology to help designers draw three-dimensional objects more quickly. Dots are plotted on the screen using a pointing gesture of a displayed hand and the verbal

> command "okay." Once all dots are in place, the command "close" will draw a curve connecting the dots. The command "sweep" causes the curve to rotate, forming a three-dimensional image which would have taken much longer to produce with standard CAD computer equipment. (Ditlea, 1990. p.33)

Where VR Research is Headed

Sandra K. Helsel and Judith Paris Roth have edited an excellent group of articles introducing newcomers to various aspects of virtual reality. The volume resulted from a Meckler-sponsored conference of the same name — *Virtual Reality: Theory, Practice, and Promise* — and most of the papers were originally published in the Summer 1990 issue of *Multimedia Review* (edited by Helsel). One article in this collection by Scott S. Fisher, entitled "Virtual Environments: Personal Simulations & Telepresence," describes NASA's Virtual Interface Environment Workstation (Helsel 1992, 101-110). In addition to the basic elements necessary for VR which were listed above, the VIEW workstation incorporates speech recognition technology, gesture tracking devices, and 360 degree magnetic head and limb position tracking technology.

Two main areas of applications for the VIEW Workstation are currently being researched at NASA, both of which have implications for the use of virtual reality in libraries. The first is "Telepresence" (think of it as being there while staying here), which NASA plans to use for robotic exploration of planets (see Carlson, 1991), but which library patrons might use to browse the Library of Congress from their local library. This is the aspect of virtual reality which has most intrigued the popular press, since persons could meet and interact in a networked world as representations of themselves. (In fact, a rudimentary version of this electronic cafe already exists in two-dimensional form for Commodore users in "Habitat," a nation-wide computer game, see Orenstein p.63.)

The other main research direction at NASA is "DataSpace" or the representation of large amounts of information in ways which can be more rapidly assessed by humans. One supercomputing expert has compared the vast differential between the amount of information which can be read (a maximum of 100 bits or characters per second) with the amount of information absorbed when viewing the world which is on the order of a billion bits per second (Larry Smarr, as quoted in Bylinsky, p.142). Virtual representations of data, as color charts or sound which can be manipulated at will by the individual, may offer even more exciting avenues of research for libraries than the armchair travel offered by telepresence. There are vast databases of information which can probably be made more understandable more quickly by the use of virtual reality and interactive simulation of data.

Boeing researchers are working on ways to use virtual reality overlays for "augmented" or "see-through" reality. For instance, workers could wear clear goggles with 3-D images reflected on the lenses, superimposing a schematic or wiring diagram onto the actual object to be assembled, or marking drill holes on a fuselage (Bylinsky, 1991, p.149). The ability to combine stored information with overlays on current projects could be applied in almost any manufacturing and design field, nearly eliminating the need to page through enormous paper manuals and simplifying training of new employees. Data representation also has implications in fields such as medicine, or in navigational control, to share information unobtrusively.

THE VIRTUAL LIBRARY

Several Visions

Also included in Helsel's book is an interesting description of one theorist's version of a virtual library, in Michael Spring's article, "Informating with Virtual Reality." Spring's article also does a good job of laying out some of the theoretical issues involved with virtual reality and the complex inter-relationships between language, visualization, and ideas. Based on research being conducted on hypertext browsers, Spring recommends a "quasi-mental visualization of the search process" rather than a concrete reproduction of it (Spring in Helsel, 1991, p,13), and gives a detailed example of an effort to index **content** as well as just show book spines residing at a remote location:

> "Imagine walking into a virtual library with a query and having all irrelevant sources appear black, all contrary evidence appear in shades of maroon to bright red, all supporting ideas represented in shades from midnight blue to blue-white, while related concepts could be depicted in shades of green and yellow. As the researcher continues and the research problem is modified, the shades and colors of the entire collection of ideas are modified to reflect the support and contradiction of the new theories. ... This example could be taken further to associate names in different sizes floating near the bright splotches of color as a mechanism for depicting authors who have written major pieces or are frequently referenced in works related to the query." (Spring, in Helsel, 1991, p.12-13)

Leaving aside some of the obvious problems with implementing such a system, try to focus on Spring's major questions which are how to visualize information (not just list sources) and how to exhibit connections between pieces of information in a manner which allows the researcher to follow those leads which are most interesting.

A quick overview of other library literature articles which describe virtual libraries or which specify uses of virtual reality technology as a means of enhancing library functions include these highlights:

- Thomas Surprenant has begun an irregular column in Wilson Library Bulletin, "Information Dreams" on the possible future of libraries. The inaugural column described a virtual library information seeking game using an "InfoGlove."

- Norman Desmarais points to the possibility of Virtual Interactive Literature, as currently under development by Myron Krueger. Readers could make plot decisions or become involved as minor characters in classics such as Shakespeare's plays or *Alice in Wonderland*.
- Chris Batt's Cutting Edge column in Public Library Journal recently took on VR [humorous to see the British view of VR notables such as Lanier]. Batt notes that librarians will have to think of themselves as occupying new roles — perhaps lending or creating virtual worlds.
- Charles Bailey, Jr., provides the best overview to date of multimedia and virtual reality and their implications for libraries in Library Hi Tech. He also stresses the importance of networks and servers in the scheme of shared information, and gives the best arguments for why librarians need to be keeping up with these trends. [If you only read one article on this topic, read this one.]
- William R. Nugent offers an historical overview of VR, as well as in-depth information on the technologies which make VR possible: interactive computers, digital imaging, and motion picture F/X. Nugent points out that these technologies are all ways of making collections more accessible to both patrons and staff, and of sharing information about resources with other libraries.

Implications for Libraries

Several of the issues raised in articles such as Spring's and Bailey's pose problems which impact upon libraries' traditional role in support of access to information or other democracy issues. I'd like to conclude by listing several problem areas which may prove to be sources of conflict as libraries begin to move into adding these new technologies to their collections:

- Intellectual property and copyright issues, especially if images are reused in a for-profit context.
- Expense of initial data conversion, location and control of electronic storage facilities.
- Delivery of materials (unless full electronic conversion and telecommunications access exists).
- Exacerbation of the gap between information haves and have-nots, resulting in creation of an information elite which has access to technology.
- Cognitive authority questions of content — whose reality is being depicted, anyway?

A host of other problems will probably plague virtual reality networks over the short-term during this initial development phase, but may be less thorny ethically:

- Remote access problems and system incompatibilities.
- Data transmission speed, response delay time (especially over long distances).
- Expense of hardware required for VR, start-up costs.

CONCLUSION

Despite these problems and as yet unresolved conflicts, virtual reality promises librarians flexibility in accessing their collections, and the opportunity to be more responsive to their patron's individual needs. With new legislation such as the Americans with Disabilities Act passing yearly, alternative means of distributing information will become more important. Virtual reality may offer a way to tailor the presentation of information to a form in which it can best be understood, not just disseminated without regard to its ability to be used.

As information professionals whose jobs will be profoundly impacted by these new technologies, it is imperative that librarians learn as much as possible about the philosophies, technologies, and vocabularies of these new information representation systems, so that we can shape the directions they will lead our society. Virtual reality is much closer to reality than to science fiction; even though it may not show up in your library within the next decade, it is coming, and in some places it has already arrived.

Virtual reality's long-term implications for libraries will be as profound as those engendered by the invention of the Gutenberg press. The fundamental mode of information transfer in our society will continue to shift from printed words, collected primarily in books and journals, to electronically simulated experiences stored in shared databases accessed through high-speed telecommunications. Academic libraries will be increasingly torn between their traditional archival function and the need to come up with funds to provide access to these virtual databases. This will make the process of collection development even more politically tense than it already is in institutions with tight budgets and multiple, sometimes conflicting, priorities.

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